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Das Brom und seine Chemische Verhältnisse. Von Carl Löwig.

Bromine and its Chemical Combinations. By Charles Löwig. Heidelberg, 1829. Translated and abridged by Elias Durand.

[Continued from p. 105.]

Bromine and Cyanogen.

These two substances combine together in two different ways: 1. By uniting bromine with cyanuret of mercury; 2. By the action of bromine upon the solution of prussic acid. In the first instance, bromides of cyanogen and mercury are produced; in the second, hydrobromic acid and bromide of cyanogen are the result. The action is very prompt, and the temperature considerably increased.

Bromide of cyanogen forms, at a low temperature, in white and spongy acicular crystals, resembling so much

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those of the iodide of cyanogen, that they may easily be mistaken for them. It becomes fluid at 39° , and gaseous at 59° , and crystallizes again when submitted to the freezing point. Its smell is similar to that of the iodide of cyanogen, and, like it, irritates the eyes powerfully. Its taste is pungent; it bleaches litmus and turmeric paper, but does not redden the former, even when dissolved in water; it is a powerful poison. Its composition is as follows:

Cyanogen	26	or	1 atom,
Bromine	75.76	or	1 atom.

Bromine and Metals.

The combination of bromine with metals, as metallic bromides, may be performed in four different ways: 1. By a direct combination, which is frequently attended with a considerable disengagement of caloric and light, as it happens with arsenic, tin, potassium, &c. especially when these metals are pulverised. The action of bromine upon potassium is attended with such an intensity of heat and light that it produces a powerful detonation, capable of bursting the glass vessels in which the experiment is made, and scattering the products of the combustion. With other metals, such as iron, bismuth, mercury, &c. the temperature must be increased, in order to produce their combustion; but platinum, silver, gold, &c. do not combine with bromine at any temperature whatever. 2. By transmitting a current of vapour of bromine over such of the metallic oxides as are possessed of a greater affinity for bromine than for oxygen, and emit as much again oxygen as the metal can absorb of gaseous bromine. Such is the case with the oxide of silver at the ordinary temperature, and with alkalies at the red heat. Vapour of bromine transmitted over the red hot oxides of potassium, sodium, barium and calcium, produce a white heat; but those of magnesium and aluminum do not; bromine circulates round the latter without evolving the smallest trace of oxygen; the same happens with the oxide of zinc. Oxides which are de-

composed by bromine seem to undergo no alteration when they are in combination with the strong acids. Balard tried in vain to separate oxygen from red hot sulphate of potassa by directing over it a current of gaseous bromine; but this does not occur when the acid has but a small affinity for the oxide. The alkaline carbonates may be decomposed by bromine, with evolution of a gas consisting of two volumes of carbonic acid and one volume of oxygen. 3. By uniting several metals with hydrobromic acid gas, some at the common temperature, others at a higher one. 4. By putting metallic oxides in contact with hydrobromic acid, some at a common temperature, others at a higher one, they are transformed into liquid metallic bromides.

These combinations are all solid at the ordinary temperature; many are fusible at a small degree of heat; such are the bromides of antimony, arsenic, zinc, bismuth, &c.; and several of these are volatile. They are all decomposed by chlorine, with which they form a metallic chloride or a chloro-bromide, if bromine is in sufficient quantity. Hydrochloric acid decomposes them at a red heat, and evolves a corresponding volume of hydrobromic acid gas. Concentrated sulphuric and nitric acids separate the bromine from the metallic bromides, sometimes mixed with hydrobromic and sulphurous gases; this happens especially with the bromides of potassium and sodium.

Metallic bromides, with a few exceptions, are soluble in water and converted into hydrobromates. Several of them combine together to form salts, which, according to Bonsdorff and Boulay, &c. are simple salts, similar to those of the oxides and to the sulphates; and according to others, form binary salts. It belongs to Berzelius to resolve this question, which he first brought up in his important treatise upon the sulphates. Without ranging himself decidedly with those of the latter opinion, Mr Löwig, in the sequel of his work, considers the combinations as binary ones.

Bromine, under certain circumstances, combines with

several metallic oxides, and forms compounds perfectly similar, as far as regards their physical properties, to the chlorides of metallic oxides. They are decomposed at a high temperature, and give up their oxygen. Sulphuric, nitric, hydrochloric, acetic, and even carbonic acids, liberate bromine from them. They oxidate many metals to the highest degree, destroy all organic colours, &c. The greatest part of the metallic bromides have a very great analogy with the corresponding metallic chlorides. One atom of hydrochloric acid gas evolves from the bromides one atom of hydrobromic acid gas.

Bromine and Potassium.

A. *Bromide of potassium.*—These two bodies combine together at a common temperature, with a considerable emission of light and caloric, and form a bromide of potassium. Vapour of bromine transmitted over red hot potassa evolves the oxygen of the alkali, and forms a bromide of potassium. Hydrobromic acid and potassium, at a high temperature, generate a bromide of potassium by separating hydrogen. Of the six different processes indicated by Mr Löwig for the preparation of the bromide of potassium, the most easy and economical is the following: saturate pure potassa or carbonate of potassa with hydrobromic acid, and evaporate the liquor; you obtain crystals, usually of a cubic form, possessing a strong sharp taste. The bromide of potassium decrepitates in the fire, and melts without undergoing decomposition. It is composed of 39.20 or one atom of potassium, and 75.76 or one atom of bromine.

It is decomposed at a high temperature by chlorine, which evolves bromine and forms a chloride of potassium. Iodine has no action upon it at a high temperature; but bromine, transmitted through melted iodide of potassium, liberates an abundance of violet vapours. Bromic acid does not decompose it at a red heat, at least when no vapour of water comes in contact with the heated mixture; in this latter case, hy-

drobromic acid is formed. The crystals dissolve in water, with production of a remarkable degree of cold; they are more soluble in warm than in cold water; the warm solution affords on cooling the recrystallization of part of the bromide. It dissolves but sparingly in alcohol.

B. *Hydrobromate of potassa* is obtained by dissolving the bromide of potassium in water, or by adding liquid hydrobromic acid to a saturated solution of potassa. It is composed of 47.20 or one atom of potassa, and 76.76 or one atom of hydrobromic acid.

C. *Bromide of potassa*.—Bromine united with carbonate of potassa produces a combination similar to that which the latter forms with chlorine. It has a yellowish colour, and bleaches and corrodes paper. Its smell is similar to that of the alkaline chlorides.

D. *Bromate of potassa*.—Mr Löwig gives four different methods for obtaining this salt; we shall only mention the two that are most easy and economical. 1. Add liquid bromine to a concentrated solution of potassa until the liquid becomes red, bromate of potassa is instantly precipitated. 2. Transmit bromine gas through a solution of carbonate of potassa until it ceases to be absorbed; introduce the vessel containing the mixture into another vessel filled with hot water; on cooling, the greatest part of the bromate of potassa crystallizes and is separated. The immersion in hot water of the vessel containing the mixture is renewed when the latter begins to cool, until it furnishes no more crystals. These crystals, as well as those of number one, are purified by solution in warm water and recrystallization.

This salt crystallizes in acicular masses, or in scales of a dull lustre. It melts as nitre at a moderate heat, without decomposing; is unalterable in the air, and of a cool taste, similar to that of nitre. It is sparingly soluble in cold water and alcohol, but very soluble in warm water. Thrown upon lighted coal, it melts and is converted into bromide of potassium, with emission of oxygen; rubbed with sulphur or

other combustible bodies, it detonates powerfully by the electric spark, or by percussion; it is decomposed by the hydracids, and by the sulphurous and hydrosulphuric acids. Its composition is 47.2 or one atom of potassa, and 115.76 or one atom of bromic acid.

Bromine and Sodium.

Bromide of sodium.—The action of bromine on sodium has not yet been examined; but it probably resembles much that of bromine on potassium. It may be obtained by heating the hydrobromate of soda to perfect dryness. It is very soluble in water, and cannot be obtained in the state of crystallization.

Hydrobromate of soda is obtained in the same way as that of potassa; it crystallizes, melts with evaporation of its water of crystallization, and is converted into a bromide of sodium.

Bromate of soda is prepared as that of potassa. It crystallizes in small and brilliant cubes containing no water of crystallization. It melts at a high temperature with emission of oxygen and generation of bromide of sodium. Thrown upon red hot coals it detonates, and explodes by percussion when mixed with combustible bodies. It is sparingly soluble in water.

Bromine and Barium.

Bromide of barium.—When bromine gas is conducted upon red hot baryta, oxygen is liberated, and a bromide of barium formed. Hydrobromate of baryta is also converted by calcination into the same compound.

Hydrobromate of baryta is obtained by saturating pure baryta or its carbonate with hydrobromic acid; the liquor is then evaporated and crystallized. It forms prismatic acicular crystals, which melted on red hot coals are converted into bromide of barium. Its taste resembles that of the hydrochlorate of baryta. It is composed of

Baryta	76.60	or	1 atom,
Hydrobromic acid	76.76	or	1 atom,
Water	9.00	or	1 atom.

It dissolves easily in water and alcohol. When a current of carbonic acid is transmitted through its solution, a carbonate of baryta is produced, and the liquid, which then becomes yellowish, may be considered as an *hydrobromous acid*.

Bromate of baryta.—When bromine is introduced into a solution of caustic baryta, an hydrobromate and a bromate of baryta are produced. The greatest part of the latter crystallizes. It is also afforded by decomposing the hydrochlorate of baryta by the bromate of potassa; if the solution be not too much diluted, the bromate will instantly precipitate. It crystallizes in small needles of a pungent taste. It is soluble in warm, but sparingly so in cold water. It melts on red hot coals, and acquires a green colour.

Bromine and Calcium.

Bromide of calcium is obtained by conducting a current of bromine gas over red hot lime; oxygen is developed, and a bromide of calcium produced; it may also be prepared by calcining the hydrobromate of lime. It forms a white deliquescent mass of a sharp and bitter taste, similar to that of the chloride of calcium, and is composed of 20.50 or one atom of lime, and 75.76 or one atom of bromine. It is converted by water into an hydrobromate.

Hydrobromate of lime exists in sponges and other zoophytes; it is prepared by dissolving the bromide of calcium in water. It crystallizes with difficulty, takes up a good deal of water of crystallization, is very soluble in water, and is converted by calcination into a bromide.

Subhydrobromate of lime is produced by boiling the simple hydrobromate with caustic lime. It forms small acicular crystals, resembling the subhydrochlorate of lime. Water converts it into simple hydrobromate by precipitating the excess of lime.

Bromide of lime.—Like the chloride of lime, this compound is obtained only with the assistance of water. It is prepared by adding bromine to the milk of lime, and separating the excess of lime by means of the filter; a yellow fluid is formed which yields its bromine when slightly heated, and its oxygen at a higher temperature; an hydrobromate of lime remains in the liquor. Weak acids, even the carbonic acid of the atmosphere, disengage its bromine, and it acts otherwise exactly as the chloride of lime.

Bromate of lime is prepared by saturating bromic acid with lime. It crystallizes in parallelopiped crystals, containing water of crystallization, and detonates on red hot coals. Taste bitter and sharp.

Magnesium and Bromine.

Bromide of magnesium.—A current of bromine gas, conducted over red hot magnesia, circulates round that earth without evolving a trace of oxygen, or combining with it. This combination is obtained by directing a current of bromine gas over a mixture of pure magnesia and charcoal, heated to redness in a porcelain tube; carbonic acid gas is evolved, but no bromine. The residue, which is a bromide of magnesium, dissolves easily in water, with a hissing noise and a considerable disengagement of caloric. The solution may be considered as a hydrobromate of magnesia.

Hydrobromate of magnesia exists in sea water and in the bittern of many salt works. It is uncrystallizable and deliquescent.

Bromide of magnesia.—Bromine, introduced into a mixture of water and magnesia, affords, by agitating and filtering, a yellow fluid, possessed at first of the alkaline properties, but soon acquiring the power of bleaching.

Bromate of magnesia.—By mixing bromic acid with magnesia, a soluble salt is obtained, similar to the bromate of lime.

Hydrobromate of magnesia and potassa.—The very di-

luted solution of a mixture of the hydrobromates of magnesia and potassa, affords by spontaneous evaporation large and transparent crystals of rhomboidal columns, which are unalterable in the air, and melt at a high temperature in their water of crystallization. Taste similar to that of borax. Their composition is as follows:

Potassa	47.20	or	1 atom,
Magnesia	20.00	or	1 atom,
Hydrobromic acid	159.76	or	2 atoms,
Water	36.60	or	4 atoms.

or

Hydrobromate of potassa	126.59	or	1 atom,
Hydrobromate of magnesia	99.39	or	1 atom,
Water	56.00	or	4 atoms.

Aluminum and Bromine.

Bromide of aluminum.—Same preparation as the bromide of magnesium, but requiring a higher degree of heat.

Hydrobromate of alumina is obtained by dissolving the hydrate of alumina in hydrobromic acid, and evaporating the solution in a water bath. Taste extremely harsh and astringent, like alum; reddening litmus very feebly. It is soluble both in water and alcohol.

Bromide of alumina.—Bromine and hydrate of alumina mixed and agitated for a length of time in water, form no combination that may be considered as a bromide of hydrated alumina, inasmuch as the filtered fluid contains no alumina.

Chrome and Bromine.

Sesquibromide of chrome.—By evaporating to dryness, and calcining the subhydrobromate of chrome, a yellowish red powder is obtained, the composition of which is as follows:

Chrome	28.00	or	1 atom,
Bromine	117.58	or	1½ atom.

Hydrobromate of suboxide of chrome is obtained, 1, By

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dissolving in water the sesquibromide of chrome; 2, By pouring hydrobromic acid over chromate of lead, agitating the liquor, and separating by filtration the bromide of lead. After boiling the liquid for some time, it acquires a dark green colour. It is uncrystallizable.

Tritobromide of chrome is produced, according to Liebig, by distilling a mixture of bromide of potassium, chromate of lead, and sulphuric acid. Löwig could not succeed in obtaining this compound, which he considers only as a mixture of bromine and of sesquibromide of chrome. It is composed of one atom of chrome, and three atoms of bromine.

Perhydrobromate of chrome is a transparent fluid, which is converted by ebullition into a subhydrobromate. It is obtained by dissolving in water the tritobromide of chrome, or by dissolving, at a low temperature, the chromate of lead in hydrobromic acid.

Manganese and Bromine.

Bromide of manganese is formed by evaporating to dryness the hydrobromate of suboxide of manganese, and calcining it in a glass tube furnished with a small hole. It is a rose-coloured mass, melting at a red heat.

Hydrobromate of suboxide of manganese is obtained by dissolving in water the bromide of manganese, or the carbonate of suboxide of manganese in hydrobromic acid. On evaporating gently, the liquid affords a light red powder.

The *hydrobromate of oxide of manganese* is prepared by dissolving in concentrated hydrobromic acid the sesquioxide of manganese. The solution, decomposed by heat, is converted into hydrobromate and into bromine.

Arsenic and Bromine.

Bromide of arsenic.—When bromine comes in contact with arsenic, they burn with a brilliant flame, with a considerable evolution of caloric, and emit a very thick vapour. This compound is obtained in an insulated state by intro-

ducing in a tubulated retort a small quantity of bromine, and throwing on it, in small portions, some pulverized arsenic until it ceases to burn. A receiver is then fixed to the retort, and the bromide of arsenic distilled over. This substance remains solid in a temperature not above 60° ; it melts a little above that point, and boils at 428° . It is perfectly transparent, of a light lemon colour, attracts the moisture of the air, smokes, and slightly volatilizes; on cooling, it crystallizes in long prisms. Its composition is, arsenic 37.60 or one atom, bromine 117.58 or one atom and a half. It is decomposed by water into hydrobromic acid and oxide of arsenic.

These two bodies form two other combinations, the *subhydrobromate of oxide of arsenic*, and *superhydrobromate of oxide of arsenic*.

Antimony and Bromine.

Sesquibromide of antimony.—Antimony, in contact with bromine, produces the same phenomenon, and is prepared in the same way, as that of arsenic; it remains solid at 201° , melts above that point, and boils at 518° . It is colourless, and crystallizes in needles. It is composed of one atom, or 64.50 of antimony, and one atom and a half of bromine.

Antimony and bromine form two other combinations similar in every respect to those of arsenic as above mentioned; and besides two binary salts, the bromide of sulphuret of antimony, and the hydrobromate and hydrosulphate of antimony.

Bismuth and Bromine.

Simple bromide of bismuth is obtained by heating in a long tube pulverized bismuth with an excess of bromine; yellowish vapours are perceived on the sides of the tube, which seem to be a bromide of bismuth with an excess of bromine, and there remains in the bottom another metallic bromide of the colour of steel, resembling a mass of melted iodine. It melts at about 392° , and acquires a hyacinth red

colour ; boils at the beginning of red heat, deliquesces in the air, and acquires a beautiful yellow colour. Its composition is 71 or one atom of bismuth, and one atom of bromine.

The other combinations of bromine and bismuth mentioned by Löwig, are the *hydrated bromide*, the *subhydrobromate*, and *perhydrobromate of bismuth*.

Zinc and Bromine.

Bromide of zinc is obtained by heating in a glass tube the hydrobromate of zinc. It solidifies in lanciform crystals in the remotest part of the tube, and is perfectly similar to the bromide of antimony. It is composed of one atom of zinc and another of bromine.

Bromide of oxide of zinc is obtained by shaking together for a long time a mixture of bromine and of oxide of zinc. The colour and smell of bromine disappear. It destroys vegetable colours.

Hydrobromate of oxide of zinc is produced by dissolving the metal in an aqueous solution of hydrobromic acid ; hydrogen gas is evolved. It is crystallizable, is decomposed by water, and melts at a higher degree of temperature than the bromide of zinc.

Tin and Bromine.

Simple bromide of tin is produced by heating tin in hydrobromic acid gas, or by heating tin with the simple bromide of mercury ; an alloy of tin and a simple bromide of tin are formed ; the latter is a brilliant whitish gray mass, melting at a high temperature into a yellow oily fluid.

Deutobromide of tin.—Tin burns in contact with bromine, and forms a solid compound of a white crystalline appearance, melting easily and subliming. It is composed of one atom of zinc, and two atoms of bromine. It may also be prepared by adding bromine to the simple bromide.

There are besides two other combinations of bromine and

tin, the *hydrobromate of suboxide*, and the *hydrobromate of oxide of tin*.

Lead and Bromine.

Bromide of lead.—One of the processes for obtaining this compound, is by digesting the oxide of lead with hydrobromic acid. It forms brilliant prismatic needles, sparingly soluble in cold water, but becoming more so by the addition of a few drops of nitric, muriatic or acetic acids.

The other combinations of bromine with lead, mentioned by Mr Löwig, are the *simple hydrobromate of lead*, which is prepared by dissolving the bromide of lead in water; the *bromate of oxide of lead*, obtained from the decomposition of the bromate of potassa by the nitrate of lead, and several binary combinations, such as those of the *bromide of lead with the oxide of lead*; the *carbonate of lead with the bromide of lead*; the *phosphite of the oxide of lead with the bromide of lead*; the *phosphate of the oxide of lead with the bromide of lead*; the *bromide of lead and potassium*; the *hydrobromate of lead and potassa*; the *bromide of lead and sodium*; and the *hydrobromate of lead and soda*.

Iron and Bromine.

Simple bromide of iron is obtained by pouring bromine upon iron filings, or by heating together a mixture of hydrobromate of ammonia and iron filings. Its colour is yellow and its fracture crystalline. It melts with difficulty, and is composed of one atom of iron and one of bromine.

Sesquibromide of iron is afforded, 1, By heating the simple bromide of iron with bromine; 2, By evaporating slowly the hydrobromate of oxide of iron; the latter is converted into a sesquibromide, with evolution of hydrobromic acid, and into a subhydrobromate of iron. It forms a brownish red mass, melting easily, and subliming at a low temperature into a mass which, in external appearance, resembles perfectly the mulsive gold.

Hydrobromate of suboxide of iron is prepared by dissolving the simple bromide of iron in water. This compound is converted by exposure to a damp air into a *hydrobromate of sesquioxide of iron*, which, being itself dissolved in water, abandons part of its oxide and becomes a *hydrobromate of suboxide of iron*.

Sesquihydrobromate of oxide of iron is obtained by dissolving in water the sesquibromide of iron, or by adding a sufficient quantity of bromine to a perfectly saturated solution of the hydrobromate of suboxide of iron. Gently evaporated to the consistence of a syrup, it affords crystals after a few days rest; evaporated to dryness, it forms a mass not distinguishable from the oxide of iron. It attracts powerfully the moisture of the air, tastes very strong, and stains the skin of a red brown colour.

Subhydrobromate of oxide of iron is obtained by the evaporation of the hydrobromate of oxide of iron, or by the decomposition of the hydrobromate of suboxide by a small quantity of potassa.

Bromate of suboxide of iron.—By mixing the solutions of sulphate of iron and of bromate of potassa, a brown red precipitate is afforded, which dissolves in a greater proportion of water, and forms a reddish brown liquid.

Bromate of oxide of iron has not been produced by a mixture of the solutions of hydrochlorate of iron and of bromate of potassa.

The binary compounds are the following: *sesquibromide of iron, and bromide of ammonium; sesquibromide of iron and chloride of ammonium; sesquibromide of iron and bromide of potassium; sesquibromide of iron and bromide of sodium; bromide of cyanuret of iron.*

Copper and Bromine.

Subbromide of copper.—To obtain this combination, it is necessary to fill up a long tube with pieces of pure wire or sheet copper, and with bromine in such manner as the vapour

of bromine may come at once in contact with all the copper. The tube should be equally heated.

Perhydrobromate of suboxide of copper is obtained by dissolving the subbromide in hydrobromic acid; it is a colourless fluid, losing by evaporation its hydrobromic acid. It precipitates metallic gold from its combinations with hydrochloric and hydrobromic acids.

Hydrobromate of sesquioxide of copper.—By evaporating slowly the simple hydrobromate of copper, a portion of its bromine escapes when arrived at a certain degree of concentration, and the liquid is converted from a green into a dark brown colour. By the addition of water, it acquires again a green colour, and a subbromide of copper is precipitated.

Simple bromide of copper is afforded by slowly melting the crystals of the simple hydrobromate of copper; or by burning copper in gaseous bromine, by which a subbromide and a small quantity of simple bromide of copper are obtained.

Simple hydrobromate of oxide of copper is obtained by dissolving in water the simple bromide of copper; it crystallizes in regular rectangular columns of a green colour.

Subhydrobromate of oxide of copper is prepared by precipitating the simple hydrobromate of copper by a small quantity of ammonia. It is a green powder which is converted by heat into oxide of copper and subbromide of copper, or into oxide of copper and simple bromide of copper.

Bromate of oxide of copper is not precipitated by mixing the solutions of hydrobromate of oxide of copper with the bromate of potassa.

The other compounds described in the work under consideration, are the *hydrochlorate of subbromide of copper*, the *oxide of copper and subbromide of copper*, and the *oxide of copper and simple bromide of copper*.

Mercury and Bromine.

Subbromide of mercury is obtained by precipitating the

hydrobromate of potassa by the nitrate of mercury, or by the action of hydrobromic acid on the suboxide of mercury. It forms a white powder perfectly similar to calomel, subliming at a moderate heat without alteration. It has no taste nor smell. It is composed of two atoms of mercury, and one atom of bromine. Mixed with an alkaline solution, a hydrobromate is formed, and the oxide of mercury is thrown down.

Simple bromide of mercury is prepared by combining directly bromine and mercury, or by subliming a mixture of sulphate of mercury and bromide of potassium; it is composed of equal atoms, and is much less soluble than corrosive sublimate.

Simple hydrobromate of mercury is produced by dissolving the simple bromide in water, or the oxide of mercury in hydrobromic acid. The alkaline solutions precipitate from its solution the red oxide of mercury, and liquid ammonia, a white powder. Besides this salt of the hydracid, two others are mentioned in the work, viz. the *sesqui and deutohydrobromate of mercury*.

Bromate of oxide of mercury is obtained by decomposing the nitrate of mercury by the bromate of potassa, or by digesting some oxide of mercury in a solution of bromine, and separating the bromide of mercury by alcohol. It is a grayish powder, soluble in nitric acid.

Under the head of bromine and mercury, Löwig mentions forty-five binary combinations of their compounds with other substances, which it would be too long even to enumerate.

Silver and Bromine.

Bromide of silver is prepared by adding to a solution of nitrate of silver an alkaline hydrobromate; a caseous precipitate is produced, which, dried in the shade, acquires a light yellow colour; when heated, it melts into a red fluid, which, on cooling, affords a yellow mass similar to horn. Its composition is 108 parts, or one atom of silver, and one

atom of bromine. On exposure to the solar rays, it becomes black, if not perfectly dry. It is insoluble in water, nitric acid, and in cold sulphuric acid; and dissolves in hydrobromic and hydrochloric acids, and in concentrated aqua ammoniæ; but diluted aqua ammoniæ has no action upon the bromide of silver, whilst it dissolves the chloride of silver. The latter is, therefore, the means of separating the bromide from the chloride of silver.

Perhydrobromate of oxide of silver.—Concentrated liquid hydrobromic acid dissolves nearly its weight of bromide of silver; on evaporating the solutions, the latter crystallizes in octahedrons.

Bromate of oxide of silver is obtained by precipitating the nitrate of silver by the bromate of potassa. It is a white powder, which is scarcely altered by light. It is insoluble in water and nitric acid, but it dissolves in liquid ammonia. Thrown upon live coals, it detonates like nitre.

The binary combinations of bromine and silver are as follows: the *hydrobromate and hydrochlorate of silver*; the *bromide of silver and ammonia*; the *hydrobromate and ammoniuret of oxide of silver*; the *hydrobromate of silver and potassa*, and the *hydrobromate of silver and soda*.

Gold and Bromine.

Bromide of gold.—According to Balard, bromine and its watery solution dissolve a small quantity of gold. A brownish yellow metallic mass, colouring animal substances of a violet colour, is thus obtained, which is converted by heat into bromine and metallic gold. According to Lampadius, gold dissolves easily in bromine, and the dry bromide of gold is of a dark gray colour, without any metallic lustre, very soluble in water, and affording a dark red solution, from which he obtained crystals of hydrobromate of gold of the same colour. One grain of these crystals will colour, in a perceptible manner, 5000 grains of water. The solution reacts nearly in the same way as the chloride of gold. Ac-

cording to the latter chemist, 100 parts of dry bromide contain 50 of metallic gold.

Platinum and Bromine.

Bromide of platinum.—Bromine has no action on platinum at the common temperature: but this metal dissolves in nitro-hydrobromic acid, affording a solution of a yellow colour, which is decomposed by caloric, and produces, in the same manner as the chloride of platinum, in the solutions of potassa and ammoniacal salts, a yellowish precipitate, scarcely soluble.

Bromine and Organic Bodies.

Bromine, from its great affinity for hydrogen, deprives of that principle almost all the organic substances, and forms with it hydrobromic acid. The latter partially combines with the decomposed organic matter, after having separated from it, by its great affinity for water, two equal volumes of oxygen and hydrogen, to form liquid hydrobromic acid. The carbon liberated from the organic matter combines also in *status nascens* with another portion of bromine, and forms a bromide of carbon, and frequently an hydrobromide of carbon by the union of bromine with both carbon and hydrogen.

By this property of altering the combination of the elementary principles of organic matter, it must, of course, destroy all contagious miasmata, putrid smells, and colours.

Bromine combines with a small number of organic substances; the only combination of this kind as yet known is that of bromine and starch, which is obtained by adding a few drops of bromine to a solution of starch. In the same way as iodine produces with the starch a fine blue colour, so its mixture with bromine is coloured of an orange yellow. It dissolves in acetic acid, which it decomposes only after some time. Alcohol takes up a large quantity, with a considerable evolution of caloric and hydrobromic acid; bromide of carbon and hydrobromide of carbon are formed. By

treating alcohol with the hydrobromic acid, an *hydrobromic ether* is produced. Serullas gives the following method for preparing it : 40 parts of alcohol of 38° of Baume's areometer are introduced into a tubulated retort with a certain quantity of phosphorus, and from 7 to 8 parts of bromine are added in small portions. As soon as the latter comes in contact with phosphorus, a combination takes place with a great evolution of caloric, and hydrobromic and phosphorous acids are produced. It is then distilled at a gentle heat, and the product collected in a receiver surrounded with ice. By mixing this product with water, the hydrobromic ether separates immediately and sinks to the bottom. It is purified from the acid which might have passed over, by washing it with a weak solution of potassa.

Hydrobromic ether is heavier than water, colourless, and becomes perfectly clear by long standing. Its taste is sharp, and its smell very ethereal. It is very volatile and soluble in alcohol, from which it is precipitated by water.

Bromine dissolves in ether with generation of caloric, and sometimes with combustion. It is decomposed in the same way as the alcoholic solution. The mixture of the ethereal solution of bromine and water, exposed to the solar rays, passes from the red colour to a brownish one ; if, then, the fluid is agitated with a weak solution of potassa, in order to remove the liberated bromine and the hydrobromic acid, a smell of acetic ether is soon evolved. By distilling a large quantity of this fluid, thus treated, Löwig was enabled to obtain pure acetic ether.

Fatty oils act slowly on bromine, which by them is converted into hydrobromic acid ; an instantaneous reaction takes place by mixing bromine with essential oils. Balard observed that by adding a few drops of bromine to the essential oils of turpentine and aniseed, a disengagement of caloric with evolution of hydrobromic acid gas took place, and the essential oil was converted into a resinous yellowish mass, resembling turpentine.

Camphor is very soluble in bromine, and loses, in a great measure, its smell and volatility. This combination, at a low temperature, becomes solid and crystalline.

On Weights and Measures. By Benjamin Ellis, M.D.

[Continued from page 135.]

In the last number of our Journal I gave a somewhat elaborate account of the origin and changes of the English system of metrology. The new French system of weights and measures, founded on the following principles, remains to be noticed.

"1. That all weights and measures should be reduced to one *uniform* standard of linear measure.

"2. That this standard should be an aliquot part of the circumference of the globe.

"3. That the unit of linear measure, applied to matter in its three modes of extension, length, breadth, and thickness, should be the standard of all measures of length, surface, and solidity.

"4. That the cubic contents of the linear measure in distilled water, at the temperature of its greatest contraction, should furnish at once the standard weight and measure of capacity.

"5. That for every thing susceptible of being measured or weighed, there should be only one measure of length, one weight, one measure of contents, with their multiples and subdivisions exclusively in decimal proportions.

"6. That the principle of decimal division, and a proportion to the linear standard, should be annexed to the coins of gold, silver, and copper, to the moneys of accounts, to the division of time, to the barometer and thermometer, to the

plummet and log lines of the sea, to the geography of the earth, and the astronomy of the skies; and finally, to every thing in human existence susceptible of comparative estimation by weight or measure.

“7. That the whole system should be equally suitable to the use of all mankind.

“8. That every measure and every weight should be designated by an appropriate, significant, characteristic name, applied exclusively to itself.”

This system originated in the stormy period of the French revolution. In a philosophical point of view it presents the beau-ideal of perfection. But when reduced to practice, it met with obstacles in the physical and moral world, in the constitution of things and the nature of man, absolutely insurmountable. Its destiny affords another striking proof that the conceptions of man are much more vast than his powers of execution. It was, however, a noble attempt to improve the condition of the human race. At the time it was undertaken there was no civilized country on the globe whose weights and measures demanded improvement more than those of France; and there was no country more abundant in the talent to conceive and the will to execute such an enterprise; none more awake to the benefit the human family would derive from its universal adoption, and none more avaricious of the glory which would redound to the nation of its birth. The excessive diversity and confusion of the weights and measures employed in France, induced the prince de Talleyrand, then bishop of Autun, in the year 1790, to suggest to the members of the constituent assembly the project of a new system of metrology, founded on a single and universal standard. For this purpose he preferred the pendulum beating seconds, and a decree modelled on his proposition was adopted by the assembly, requiring, 1. That exact copies of all the different weights and elementary measures *used* in every town in France should be obtained and sent to Paris. Louis the XVI. was requested by the assembly personally to address a letter to the king of England, in-

viting him to propose to the parliament the formation of a joint commission of members of the Royal Society, and the Academy of Sciences. It was designed that this commission should meet at the most suitable place, and proceed immediately to ascertain the length of the pendulum at the 45th degree of latitude, and from it form an invariable standard for all weights and measures. Finally, the French academy were to fix with precision the tables of proportion between the new standards and the weights and measures heretofore used throughout the kingdom, and to supply every town with copies of these tables. Either owing to national jealousy, or the peculiar temper of the times, the proposition was not seconded on the part of Great Britain; and the only opportunity ever yet presented for the formation of a common standard of weights and measures between these two great nations, was lost. Other nations, however, were invited to furnish their share of talent and learning, and to participate in the honours and the benefit that would arise from its completion. Spain, Italy, the Netherlands, Denmark, and Switzerland, were actually represented in the academy, and contributed to the accomplishment of the common object. The committee of the academy chosen under the decree of the assembly consisted of Borda, Lagrange, Laplace, Monge, and Condorcet, five of the most eminent mathematicians of Europe. On the 19th of March 1791, they reported to the academy, a copy of which was transmitted forthwith to the assembly, and there ordered to be printed. Three natural standards presented themselves to the committee, viz. the pendulum beating seconds, a quarter of the equator, and a quarter of the meridian. After full deliberation they gave the preference to the last, and proposed that its ten millionth part be taken as the standard unit of linear measure: that the pendulum beating seconds at the 45th degree of latitude be assumed as a standard of comparison with it; and that the weight of distilled water, at the point of freezing, measured in a cubical vessel in decimal proportion to the linear standard, should determine both the standard of weights and

the vessels of capacity. For the execution of this plan they proposed six distinct scientific operations, to be performed by as many separate committees of the academy.

"1. To measure an arc of the meridian from Dunkirk to Barcelona, being between nine and ten degrees of latitude, including the 45th, with about six to the north and three to the south of it, and to make upon this line all suitable astronomical calculations.

"2. To measure anew the bases which had served before for the admeasurement of a degree in the construction of the map of France.

"3. To verify, by new observations, the series of triangles which had been used on the former occasion, and to continue them to Barcelona.

"4. To make, at the 45th degree of latitude, at the level of the sea, in vacuo, at the temperature of melting ice, observations to ascertain the number of vibrations in a day of a pendulum, equal to the ten millionth part of the arc of the meridian.

"5. To ascertain, by new experiments, carefully made, the weight, in vacuo, of a given mass of distilled water, at the freezing point.

"6. To form a scale and tables of equalization between the new measures and weights proposed, and those which had been in common use before."

The assembly having sanctioned this report, appointed four committees of the academy, and entrusted the execution of the three first named objects to one committee, consisting of Mechain and Delambre.

Borda, Mechain, and Cassini undertook the experiments on the pendulum; those on the weight of water were committed to Lefevre Ginæau, and Fabbroni; and the scale and tables to a large committee on weights and measures.

More than seven years were spent in the accomplishment of these different operations. In prosecuting those experiments instituted to ascertain the weight of distilled water at

the freezing point in vacuo, and for the admeasurement of the arc of the meridian, two important and highly interesting discoveries were made. Newton long since ascertained that the earth was not a perfect sphere, but an oblate spheroid, flattened at the poles. But the proportions of this flattening, or the difference between the two diameters of the earth, had only been conjectured from a number of facts. As the arc now to be measured exceeded any former attempt in the distance, the committee who undertook it were instructed to ascertain with greater accuracy the difference between the circles of the meridian and the equator. The result of their researches was that the flattening was of $\frac{1}{334}$; or that the axis of the earth was to the diameter as 333 to 334. The other discovery was the important law of nature now known to every tyro in philosophy, that freezing water not only ceases to contract at 41° of Fahrenheit, but actually commences to expand until it is fixed in ice at 32° . Anterior to these experiments it was believed that the freezing and expansion were simultaneous.

The legal weights and measures of France were employed in the prosecution of these operations. The standard from which the measures were taken for ascertaining the arc of the meridian was the toise or fathom of Peru, so named from having been employed for the same purpose in that section of South America.

Delambre and Mechain used two platina rods in their mensurations, each double the length of this toise of Peru. A repeating circle, a levelling instrument, and a metallic thermometer with two blades, one of brass, the other of platina, designed to show the effect of the atmospheric changes on the two metals, were also employed by the committee. The weights used for comparison with the new standard were a pile of 25 Paris pounds, called the weights of Charlemagne, which, though not of the antiquity of that prince, had been in use for more than 500 years.

The toise of Peru measured six standard royal feet of

France, the foot twelve thumbs, and the thumb twelve lines, so that the toise was equal to seventy-two thumbs, or eight hundred and sixty-four lines. The standard metre of platina, the ten millionth part of the meridian measured on the brass fathom of Peru, 443 lines and 295.936 decimal parts of a line. The definitive length of the metre was, therefore, fixed at 443.296 lines, equivalent by subsequent experiments of the academy to 39.3827 English inches.

The Paris pound, *pois de marc* of the pile of Charlemagne, consisted of two marks, each mark of eight ounces, each ounce of eight gros or drachms, and each gros of three deniers or pennyweights, and each pennyweight of twenty-four grains.

The pound, therefore, contained 9216 grains, equal to fifteen ounces, fifteen pennyweights, or 7560 grains, troy weight. The cubic decimetre, or tenth part of the metre of distilled water, at the temperature of its greatest density, weighed in vacuo, was found equal with $18,827\frac{15}{100}$ grains, or 2 pounds 5 gros $35\frac{15}{100}$ grains of the mark weight. This was denominated the *kilogramme*, and was made the standard weight, its $\frac{1}{1000}$ part being the gramme or unit, equivalent to 15.44572 grains troy. The vessel that would hold this kilogramme of water at its greatest density was made the standard for all measures, liquid or dry, under the title of the *litre*. It contains 61.0271 cubic inches, about one-twentieth more than our wine quart. The metre was applied to superficial and solid measures, according to their proportions; the chain of ten metres being applied to land measure, and its square denominated an *aré*; the cubic metre was called a *stere*.

To complete the system, every weight and every measure had a new and specific denomination attached to it. To all of these weights and measures, the principle of decimal arithmetic was exclusively applied. The units were all multiplied and divided by the number 10.

This system encountered difficulties from its very birth.

The admeasurement of the meridian commenced when the whole nation was under the excitement of revolutionary movements. The suspicions of the people were alarmed at the appearance of the commissioners while prosecuting the survey, and took them for spies or engineers of the invading enemies of France. And before the original plan could be completed, the national assembly passed a law, on the first of August 1793, directing the system to go into immediate operation. The standard metre was to be taken from the old admeasurement of the meridian in 1740. New denominations, decimal divisions, and a complete system of weights and measures were to be based on this standard, all of which, however, were to be temporary, and to yield precedence to the other when the definitive length of the metre should be ascertained. This act suspended, as was probably intended, the further prosecution of the original plan. Nevertheless, in September 1793, a decree was passed authorising the temporary continuance of the committee on weights and measures; yet in December following, a decree of Robespierre's committee of public safety dismissed from the commission Borda, Lavoisier, Laplace, Coulomb, Brisson and Delambre, on the pretence that their republicanism was not sufficiently pure. Mechain was at this time a prisoner in Spain.

The commission of weights and measures was directed by a decree of Robespierre and his committee to forward to the United States of America a copper metre and weight, exact copies of the standards just then adopted. On the 2d of August 1794 the French minister, Fauchet, sent them to the secretary of state, with a letter earnestly recommending them to the adoption of the United States. The president communicated the subject to congress in 1795.

On the 7th of April 1795, the national convention passed a decree, authorising all the operations in the measurement of the meridian to be renewed, and at the same time abolishing the temporary nomenclature, and establishing a new one,

which has remained permanently a part of the system. The units which have been already mentioned, viz. the grammé, metre, aré, litre and stere were not altered. To express the weights or measures growing out of these units by multiplication, the Greek words denominating 10, 100, 1000, 10,000, &c. were prefixed as additional syllables, while their division into 10, 100, 1000 parts, &c. was expressed by similar Latin syllables.

Thus,	Millimetre	0.001
	Centimetre	0.01
	Decimetre	0.1
	Metre	1
	Decametre	10
	Hectometre	100
	Kilometre	1000
	Myriametre	10,000.

Nothing can be more simple and beautiful than this nomenclature in theory; but it was the most difficult of all the parts of the system to reduce to practice. It consists of twelve new words, five of which denote the things, and seven the numbers; and by their combination form significant and appropriate names for every weight and measure in the new scheme. Thus one of the greatest sources of error and confusion is avoided in weights and measures, viz. the application of the same name to different things, or of different names to the same thing; and as the whole turns on the pivot of decimal arithmetic, the mind appreciates the quantity of the weight or measure by the appropriate name. But habit exercises unbounded influence over our minds. The French people refused to adopt this nomenclature, and while they were obliged to part with the old system of weights and measures, and accept a new one founded on philosophical principles, standardised on the immutable circle of the globe, they insisted on employing the old names. Thus they call one-half of a kilogramme a pound, and one-third of the metre they denominate a foot. Now this weight is not a pound,

nor this measure a foot, but they are very near them, and, therefore, they obtain a more correct idea of their respective values, by applying to them names with which they are familiar, than those which convey to them no idea at all, or a very indistinct one.

The same decree of 7th of April, which authorised the adoption of this nomenclature, directed that all the operations commenced under the direction of the academy of sciences should be renewed ; and the persons employed in their execution were reinstated by the committee of public instruction of the national convention. The admeasurement of the arc of the meridian was at once resumed by Mechain and Delambre, and successfully executed.

The former conceived the idea of extending the survey to the Balearic isles, which would have made the portion of the arc south of the 45th degree equal to that northward of it. This supplementary task was nearly completed when he was arrested by death, in September 1805, in the Spanish province of Valencia.

His more fortunate associate, Delambre, published an account of this admirable undertaking in 4 vols, 8vo. Their whole proceedings in this admeasurement were submitted to a committee of the mathematical and physical class of the national institute, that phoenix of science, which had risen on the ashes of the academy of sciences. The experiments on the length of the pendulum, and for ascertaining the specific gravity of distilled water at its maximum of density, were submitted to the same committee. The whole was embraced in two reports made by Tralles of the Helvetic confederation, and Van Swinden of the Netherlands, two of the foreign associates who had been invited to co-operate in the labour, and participate in the honour of the undertaking. Van Swinden combined these two reports into one, for the general meeting of the institute ; and that body transmitted it with all due solemnity to the two branches of the national assembly of France, on the 22d of June 1799, together with

a definitive metre of platina made by Lenoir, and a kilogramme of the same metal made by Fortin. La Place, the presiding member of the institute, made an appropriate address, which was returned by the respective presidents of the two legislative chambers. The standard metre and kilogramme were deposited on the same day in the hands of the keeper of the public archives, who recorded the fact and signed it, together with all the members of the institute, foreign associates and artists, whose joint labours had contributed to the accomplishment of this great work.

The temporary metre and kilogramme made from the old admeasurement of the meridian, and adopted in 1793 and 1795, were abolished in December 1799.

That metre had been fixed at $443\frac{44}{100}$ lines, while the new and definitive metre was determined to be $443\frac{296}{1000}$ lines, a difference scarcely appreciable for ordinary uses, yet perceptible when multiplied to the cube for the measure of capacity and weight. Thus the temporary kilogramme had been of 18,841 grains mark weight, while the new and definitive one was reduced to $18,827\frac{15}{100}$ grains. But the thirst of novelty and change was only surpassed by the general infidelity of the French philosophers and rulers; and as a principle of uniformity, it was urged that in regulating weights and measures, the mensuration of time ought to be included.

It was therefore determined, as the origin of the French republic formed a new era in the world, to abolish the Gregorian calendar, and commence the new year with the day that the republic was established, viz. 22d of September 1792.

The division into twelve months was retained, but each month was divided into thirty days, or three times ten. The seventh day, as a day appropriated to piety and repose, was abolished, and every tenth day was dedicated to some moral abstraction, such as liberty, equality, fraternity, patriotism, &c. and once a year to the Supreme Creator, whose exis-

tence the national convention did him the honour, in the plenitude of their wisdom, to acknowledge by a formal declaration.

Five or six complementary days remained after the completion of the thirty-six decads, and these were holydays, in which were to be revived the Olympic games of ancient Greece.

The names of the months were to be significant, and this part of the system was as beautiful as the other was ridiculous. Each of the three succeeding months composing the four seasons of the year, were to have the same terminating syllable ; thus, the word *aire*, expressive of the feelings accompanying autumn, was to be assigned to this season ; the 2d, *ose*, was believed appropriate to winter ; the 8d, *al*, expressive of the sprightliness of spring, and the 4th, *dor*, significant of the fervid temperature of summer.

Thus in autumn, Vendemi-aire was the month of vintage ; Brum-aire the month of fogs ; and Frim-aire the month of incipient cold. Winter comprised Niv-ose, the month of snow ; Pluvi-ose, the month of rain ; and Vent-ose, the month of wind. Then followed smiling and musical spring, Germin-al, the month of buds ; Flore-al, the month of blossoms ; and Prairi-al, the month of blooming meads. Finally, for summer, Messi-dor, the month of harvests ; Thermi-dor, the month of heat ; and Fructi-dor, the month of fruit.

The days of the decad were to be denominated according to their number ; thus, primedi, the first day ; duodi, the second ; and so on to decadi ; the tenth day, which was devoted to relaxation and the contemplation of virtue.

But the new calendar clashed with the new metrology in the article of the pendulum. The day was to be divided into 10 hours, each of 100 minutes, and each minute of 100 seconds : now the pendulum, in this case, would be required to vibrate 100,000 times in 10 hours, or one day, while the pendulum beating seconds of the old calendar, and designed

as a test for the metre, would only oscillate 86,400 times in the solar day of 24 hours.

For the space of twelve years such was the calendar of the French nation : but the division of the day into 100,000 parts was first indefinitely suspended in April 1795. In April 1802, when Napoleon was first consul, a law was passed retaining the *equinoctial* calendar for all civil purposes, but, resuming the *solstitial* or Gregorian calendar, so as to restore the week of seven days with their names, and its sabbath as the first of them. But on the 9th of September 1805, in the month of fruits, when Napoleon had been crowned emperor, and France claimed the incongruous title of "*republican empire*," a senatus consultum ordained that on the 11th of the torpid month of snows, Nivose, 14th year of the republic, the 1st of January 1806 should reappear, and the Gregorian calendar be restored to use throughout the kingdom.

The application of the metrical system to geography and astronomy was a more rational and desirable part of the scheme : but it was found to be impracticable, as it would have rendered useless all the tables, maps, charts, and instruments indispensable to the geographer or navigator, as they are now, and have always been constructed. The quadrant would have been divided in 10 parts each of 10 degrees, and each degree therefore would have been equal to 100,000 metres, and the number of degrees to encircle the earth would have been 400. The facility of nautical calculations would have been increased ; but the division of the sphere into 360 and quadrants of 90 degrees, originated in the coincidence of the daily rotations of the earth in its orbit round the sun, which, as near as numbers can bring it, is one degree every day. This, together with the division of the day into 24 hours, founded on a similar coincidence of time in the rotation of the earth round its axis, as well as all the details of this system, have been in use from immemorial time among all civilized nations, and to abolish it could not

tend to uniformity, unless it were certain the other would be as universally adopted.

In the construction of the thermometer and barometer, the application of the decimetre to them increased their facilities for observation and calculation. The thermometer had always been graduated in an arbitrary manner, and was different in different countries. Reaumur's thermometer, used in France, put the freezing point at 0, and that of ebullition at 80. Fahrenheit's, commonly used in England and the United States, has the freezing point at 32°, and the boiling point at 212°.

The centigrade, whose graduation is on the principle of decimal arithmetic, has the point of congelation fixed at 0, and that of ebullition at 100. Its degrees are to those of Reaumur as 5 to 4, and to those of Fahrenheit as 5 to 9.

It was also attempted, and with some success, to regulate the coins and moneys of France by the new metrology; but, as this was pursued separately, and only made incidentally dependent on the other points of the scheme, it was consequently less perfect than it would have been, had it been made, as in the old system, an essential part of the structure. The application of the metrical system to the tonnage of ships and boats, and size and form of casks, was not among the least of its difficulties. The habits of a nation, confirmed by the usage of centuries, were not to be set aside in an hour by the decree of any government, however strong and despotic. The law with respect to the employment of the new system in ascertaining the tonnage of ships, was founded in error, and was probably never enforced. That regulating the size and form of casks was found to be impracticable, and was consequently revoked.

The new system was carried into every department of human pursuits. The mariner's compass, the log line, sounding line, and ships' cable, were all included in the scope of decimal metrology.

It was before observed that the adoption of the new

nomenclatures was opposed by an unwillingness or obstinacy on the part of the French nation, that was completely insurmountable. The supreme law of the land was made to bend, therefore, before the will of the people, and after a vascillating legislation, an imperial decree was issued in 1812, which, while it retained the *units* of the new weights and measures, allowed them to be divided by other than decimal numbers. Thus gradually were the old names re-introduced and applied to measures and weights to which they never before belonged. For retail sales of all articles which are sold by weight, the shopmen were allowed to employ the following *usual weights*.

The pound (*livre*), equal to half a kilogramme, or 500 grammes, which shall be divided into sixteen ounces.

The ounce (*once*), or one-sixteenth part of the pound, which shall be divided into eight gros.

The gros, or one-eighth part of the ounce, shall be divided into halves, quarters and eighths.

They shall bear with their appropriate names the indication of their weight in grammes.

So far as I can learn, the present condition of the French metrology varies but little from the form it assumed under the imperial decree of 1812. That decree, while it allowed the people to use a system grafted on the new metrology, retained the latter for all commercial transactions on the large scale, required that it should be taught in all the schools, and be exclusively used in all the public offices, markets, &c.

Such is the aspect of this splendid monument of genius and learning. If the old system of France was confused and diversified—if scarcely two cities employed the same weights and measures, she has little to boast of on the score of improved uniformity; for we now find the remains of four systems, established at different times, and superseding each other.

1. That which existed before the revolution.

2. The temporary system established by the law of 1st August 1793.

3. The definitive system established by the law of 10th December 1799.

4. The usual system permitted by the decree of 12th February 1812.

The difficulties which this system has encountered, and the changes which have forced themselves upon it, in the attempt to reduce it to practice, sufficiently show the impracticability of breaking up by a coup de main the established usages of centuries.

It is evident that the authors of this system, in the ardour of their search after an universal standard for weights and measures, had more regard to the theories of philosophy than the moral nature of man. Laws and customs spring out of the constitution of man, modified always by the circumstances which surround him.

The foot, a measure which had been in use at least since the times of the ancient Greeks, possessed several superiorities over the metre. It was derived from a member of the human body, was an aliquot part both of the pace and the fathom, and was, moreover, portable, and, therefore, accessible on almost every occasion in which it might be demanded. The metre is a rod of forty inches, and therefore as inconvenient for the mechanic as the English yard; neither are the half metre or decimetre capable of supplying the advantages of the foot. The half metre is, indeed, equivalent to the cubit, but this antediluvian measure was in part discarded; on account of the more convenient shortness of the foot. But there were other difficulties. Every one is struck at the first glance of this system with the beautiful simplicity which it derives from decimal arithmetic. It appears, however, to have been overlooked, that although decimal arithmetic is admirably designed to facilitate the calculation of mere numbers, it is not equally well suited to the divisions of material substances. A line, weight, or measure, may be divided with

the greatest ease, almost by the eye, into halves, quarters, and eighths, but the division into fifth and tenth parts is attended with much greater difficulty. Moreover, the decimal division is itself only divided by the numbers of two and five. So great are the advantages of the duodecimal division, divisible by two, three, four and six, that it was proposed, when the French theory was in contemplation and under discussion, to substitute the number twelve for ten as the term of the periodical return to the unit.

The leading features of the French and English systems of metrology are indeed very different. Of the latter, however, we see only the ruins of what was once a beautiful scheme, perfectly adapted to the nature of man, growing out of his wants, and improved from age to age, until it was nearly perfect. It was then unfortunately impaired by Edward I. when he destroyed the identity between the money weight and the silver coin by debasing the latter. The French system sprung into existence full-grown and perfect; it is the child of philosophy and civilization; and had those who were to employ it been as enlightened as its authors, they would not have wantonly annihilated all its just and beautiful proportions. The system of England derives its natural standard from the human foot, divided by the barley-corn; and the material positive standard is a three foot iron rod, deposited in the British exchequer.

To it belong two units of weight and two measures of capacity, the natural standard of which is the difference between the specific gravities of wheat and wine. The smaller of these weights was originally identical with the silver coin, a property now lost irrecoverably. These two pounds are standards of verification to each other, and are in the proportion of 144 to 175, the pound avoirdupois being 7000 grains troy. Twelve per cent are added to the English weights whenever a quarter of a hundred or more is weighed; thus 28 pass for 25, 56 for 50, &c.

This custom, it is said by Gray, originated with the Ro-

mans, allowing the merchants for waste 20 ounces to the pound at first, so that 100 pounds were 125 common pounds. The allowance was afterwards reduced to 18 ounces to the pound, making 112½ pounds for 100. The half pound is now omitted, and only 112 considered as 100 pounds weight. It is, however, supposed that the custom may have originated from the incapacity of the true hundred to be divided lower than 25 without a fraction.

The connexion of the linear measure in the English system with the weights, is by the specific gravity of spring water, one thousand ounces avoirdupois exactly filling the measure of a cubic foot. The division in this system of weights and measures is made without any reference to any apparently settled standard. The foot into twelve inches, the inch by law into three barleycorns, sometimes in practice into halves, quarters, eighths and twelfths, and sometimes into decimal parts.

The pound avoirdupois is divided into sixteen ounces, and the pound troy into twelve, so that while the ounce of the latter is larger, the pound is lighter than the pound avoirdupois. The ton in the English system is both a weight and a measure. As a measure, it is divided into four quarters, the quarter into eight bushels, the bushel into four pecks, &c. As a weight, it is divided into twenty hundreds of 112 pounds, or 2240 pounds avoirdupois. The gallon is divided into four quarts, the quart into two pints, and the pint into four gills, &c.

But in the English system the nomenclature is very objectionable, the same name being applied to different weights, measures, &c. Thus the term pound signifies two distinct weights, and a money of account; and indeed all over Europe this word is applied to weights of very different sizes. The gallon is used to denote two measures of unequal capacities, and which are not employed for the same purposes.

The French derive their standard from an aliquot part of the circumference of the globe; and the material rule is a

platina metre in the national archives, decimally divided. There is but one standard for weight and one for measures of capacity, and, therefore, there is no common test of verification for both, as the litre gives the weight of water only. With the inconvenience of two weights and measures, the English system nevertheless has this advantage, that both the measures are a weight. Thus the gallon of wheat, and gallon of wine balance each other as weights. They each weigh eight pounds avoirdupois. This remark must be understood as applying only to the system as it was formerly, and not to its present condition. The difference between the specific gravities of wheat and wine is still the difference between the avoirdupois and troy weights, but not between the corn and ale gallons.

The French weight is not a coin, but the metallic coins are weights. Gold, silver, mixed metal, and copper, are all coined in weight, and relative value prescribed by law.

In the monetary system of the United States, every trace of identity between the weights and coins has vanished by the disuse of the terms pound and penny. Our coins are of prescribed weight and purity, but in no convenient or uniform proportions to each other.

The standard linear measure of the French system is connected with the weight and measure of capacity by the specific gravity of distilled water at its greatest density; one cubic decimetre of such water being the weight of the kilogramme, and filling the litre. To the divisions of this system, decimal arithmetic was exclusively applied by law; the binary was allowed as compatible with it, but all thirds, fourths, sixths, eighths or twelfths were rigorously excluded. This part is now abandoned, and the people are allowed the use of the duodecimal divisions. The nomenclature, too, though exceedingly beautiful and simple, has been thrown aside in practice. No two words express the same thing; no two things are expressed by the same word; but every word expresses the unit weight or measure which it represents, or the particular multiple or division of it.

On Moxas and their Preparations. By Elias Durand.

The employment of moxas as a remedial agent has, from time immemorial, been highly valued by the Chinese and other eastern nations. The Greeks and Egyptians were acquainted with it, and it is yet considered by the descendants of the latter as a sovereign *panacea*.

This medicine was introduced into Europe by the Portuguese, who were the first Europeans that penetrated into China and Japan. It was partially adopted by several continental nations; but the French became, especially, very partial to it, and have of late paid great attention to the improvements of their indigenous moxas. The English and American surgeons, on the contrary, preferring the employment of caustics to that of moxa, have rather neglected this subject, and little has been said by them respecting the nature and employment of this remedial agent. Hence the almost general ignorance of it in this country, among our surgeons and pharmacutists, who are unacquainted with the medical literature of France; hence, also, the great difficulty, not to say impossibility, for those who have read or heard of the efficacy of this medicine in certain cases, to procure or prepare it for themselves, when an opportunity occurs of ascertaining the good effects it has afforded to other practitioners.

As unsuccessful calls for moxas are occasionally made in our stores, we have been induced to publish a short account of these preparations, with the expectation that, in a Journal like this, intended to promote the progress of the different branches of our art, it would find a suitable place, and would be acceptable to many of its readers. It is neither our intention nor department to discuss the merits or demerits of the actual cautery by moxa, or to mention the cases in which its employment has proved efficacious. We refer for this information to the works cited below, and shall confine ourselves

to the task of giving a concise history of this remedial agent, and point out the better preparations used by the French as substitutes for the Chinese moxa.

The word *moxa* is of Portuguese origin, and signifies a match, on account of its likeness to this article. The Chinese call it *kiew*. When the Portuguese penetrated to China and Japan, they found the adustion by moxa so generally used among the Asiatic nations, that almost every individual was provided with his *kiew*. These people prepare their moxas by drying carefully, in the shade, the leaves of their indigenous mugwort, *artemisia chinensis*, a plant considered by botanists as a mere variety of the common European mugwort, *artemisia vulgaris*. When the leaves are perfectly dry, they separate the fibres and nerves, pound them up in the same mortar in which they grind their rice, until they are converted into a soft and silky *tomentum*, which is rolled up in small matches or twists, somewhat similar to our chewing tobacco.

That this *tomentum* is not, as was supposed, the down of the leaves of the mugwort, is satisfactorily ascertained by the very name of *kiew*, which, in the Chinese language, signifies *mortar*, and by the inspection of the plant itself, which is scarcely more tomentose in China and Japan, than the same plant cultivated in the botanical gardens of Europe. Besides, the Chinese moxas do not differ in any respect from those prepared in France by the process indicated above, either from the dry plant imported from China, from the same plant cultivated in Europe, or from the leaves of the common European mugwort. The appearance, softness, inflammability, and the property of burning slowly, are perfectly similar.

In the time of Hypocrates, the Greeks were acquainted with the adustion by moxa, which they generally performed by applying on the skin small cushions of raw or boiled flax. The father of medicine employed a metallic or box-wood spindle, previously plunged in boiling oil, and then applied

it with force on the part where it was intended to produce an eschar. The compression to which this spindle was submitted produced a sinking of the skin in the form of a small cup, in which a few drops of boiling oil were poured, which, after standing a sufficient time in contact with the skin, afforded a complete cauterization.

Drs Percy and Clement have, in many instances, tried the effects of the latter method, and have found it to possess several advantages. They have since employed, with still more success, a small hemispherical spoon or box, made of a single piece of metal, in which they introduce a small quantity of spirit of turpentine, or alcohol of 30 degrees. After setting fire to the liquid, they apply the instrument, by means of a long stem or handle adapted to the spoon, on the surface to be acted upon, until the desired effect is produced. This application may be rendered rubefacient, cathartic, vesicating, or escharotic, as the case requires. Its action may be easily suspended, the instrument removed and applied again, or transferred to another part; in a word, its action may be variously modified, according to the degree of sensibility, or resolution of the patient.

The employment of moxa was also, for ages, familiar to the Egyptians, and is still among the poor the universal remedy for all kinds of disorders. Their moxa is prepared with cotton wrapt up in a band of linen, secured by a silk thread; its form is pyramidal or conical, with an aperture or air hole in the centre, and its length is from two to four lines; they apply it to the skin and secure it by means of an adhesive substance; then set fire to the top, taking care to keep constantly a piece of cold metal on the surrounding skin, in order to temper the heat and prevent the inflammation extending farther than the base of the moxa.

This Egyptian moxa has been frequently used by the French surgeons, but the necessity of blowing upon it to increase the flame, which otherwise would soon expire, becomes excessively troublesome and annoying to the ope-

rator. The offensive smoke produced by the combustion of cotton and linen powerfully irritates the eyes. Dr Larrey has, however, succeeded, by means of the blow-pipe, to use it with advantage*; but, in an unskilful hand, the blow-pipe is apt to increase the heat to too great a degree of intensity, and thus to produce too deep an eschar.

This great inconvenience of the Egyptian moxas has been removed by recurring to substances which, once lighted, burn of themselves, without the aid of ventillation or insufflation, with the mouth or the blow-pipe. The first self-burning moxas were employed in the French military hospitals; they were made with the common gun-match and answered remarkably well the purpose for which they were intended, &c.

The manner of preparing and applying them was neither long nor difficult, and the article never wanting in the army or garrisons. These moxas were performed by fastening the end of the inflammable cord with a small metallic wire, twisted two or three times round the match; then, with a knife, the cord was cut above the wire, so as to afford a cylinder two or three lines long, in the middle of which the wire is fixed, holding fast together the strands of the match. When a greater effect was wanted two or three cords were united together in the same way. This section of match was lighted at one end, applied to the skin by the other, and kept in its place with pincers. This moxa produces effects without

* Baron Larrey's moxa is about one inch long, and of a proportional thickness. It is applied by means of an instrument called *porte-moxa*, moxa bearer, composed of a metallic ring furnished with a handle, supported by three small pieces or feet of ebony wood (a bad conductor of caloric) which prevent the ring from coming in contact with the skin. The moxa is fixed inside of the ring. The part intended to be burnt is marked with ink, and the surrounding parts are covered over with a wetted rag, having a hole in the middle, to leave naked the part covered with ink. The moxa is then lighted and applied. The wetted linen preserves the skin from the sparkles produced by the insufflation by the blow-pipe. In order to prevent a deep inflammation and a too great suppuration from taking place, Dr Larrey washes the burnt part with spirit of hartshorn or Cologne water.

interruption or assistance by insufflation from the bellows or blow-pipe, and burns to the end; the eschar produced is always of the same diameter, (the base of the moxa being of a uniform thickness), and frequently falls off in a single piece when suppuration is sufficiently established.

The self-burning moxas are now pretty generally used in France, but the gun-match is no longer employed. They are made of cotton impregnated with nitre. This cotton is prepared by suspending one pound of this substance in an earthen pot, with a cover both perfectly glazed inside, and containing a solution of two ounces of nitre in two quarts of water. In this state the cover is well luted, and the pot kept for several successive nights on the warm ashes, when the fire is covered, or in an oven with the bread, until all the water is evaporated and the cotton perfectly dry. It is then either rolled up upon a small rope or cylinder of linen, until it has acquired a sufficient size, and the form of a cone several lines long, or wrapt up in a piece of linen in the shape of a cylinder, of which, when required, a section of an appropriate thickness is cut with a sharp razor, and applied to the skin in the same manner as the preceding. The moxas called by Dr Percy *poupées de feu*, are prepared in the same way as the Egyptian moxa cited above, with a hole in the centre to facilitate combustion, but they are made of cotton impregnated with nitre. Their combustion is very rapid, and they are employed in cases where a deep impression and a more considerable eschar are intended. All these different moxas are secured on the skin by a piece of adhesive plaster cut crossways in the centre, or by a piece of metallic wire or pincers.

Some animal substances, such as silk, wool, &c. might also form good moxas, were it not for the strong ammoniacal smell they emit during their combustion. Every vegetable substance capable of being penetrated by nitre, may be employed for this purpose. The pith or *meditullium* of several plants is well calculated to afford good moxas; that of the

sunflower, *helianthus annuus*, is particularly well adapted to these preparations; it is tolerably thick, and contains naturally a sufficient quantity of nitre to burn easily of itself, and its effects are milder than those of any other substance. They are, for this reason, called by the French *moxas de velours* (velvet moxas). But the pith must be of good quality, and procured from plants which have grown in a proper soil, and from stems perfectly ripe. The stem is cut with a small saw in sections half an inch thick, dried with caution, and kept in a place perfectly free from dampness. The pith is very white, and the cortical part may be smoothed and polished by artificial means. This medullary moxa burns without interruption, and the heat is transmitted to the skin before one-half of it is consumed. It possesses over the above mentioned the following advantages: 1. The cortex which has been preserved around the pith, being a bad conductor of caloric, permits the operator to secure the moxa with his fingers on the part acted upon, without any danger of burning himself; 2. The intensity of action of this moxa may be moderated by pressing the cortical part on the skin, and thus preventing it from burning too quickly, &c.

These medullary moxas are, however, frequently defective, from the difficulty of procuring good pith. Sometimes the dessication to which they have been subjected has not been complete; at others it has been performed unequally, so that certain parts burn quicker than others; frequently, also, the plants, as we have mentioned above, have not acquired a sufficient degree of maturity; the cells of the pith are full of juices, which, by dessication, afford a compact matter, burning with difficulty, or when they are too ripe, the *meditullum* is spongy, and the tissue ruptured; hence a rapid combustion with too little effect. Sometimes also the soil has not afforded to the plant a sufficient quantity of nitre to permit the pith to burn well.

Mr Robinet, a French pharmacist, has succeeded so completely, however, in preparing medullary moxas as to

leave nothing farther to be desired. He reduces the pith of the sunflower plant to a small volume, and covers it over with cotton until the moxa has acquired a sufficient thickness; he then consolidates the whole with a muslin envelop, and thus obtains cylinders of an homogeneous composition, which the volume of the pith causes to burn uniformly; the meditullium, upon which the cotton is rolled up perfectly even, acts as a wick to the moxa, and inflames equally the latter substance.

By pressing the cotton with more or less force, moxas may be obtained of different degrees of activity; they vary in volume as required, and present all the following advantages: they burn without insufflation; their combustion is uniform, gradual, and complete; the heat they produce is almost immediately transmitted to the skin, and goes on increasing until it becomes sufficiently intense to cauterize the skin. The operator may, as he wishes, increase the energy of the moxa by having the incandescent coal that is produced a longer time in contact with the part, or avoiding the eschar by covering the base of the moxa with paste, which permits the removal of it when combustion has reached the interior part*.

* Vide Clinique Chirurgicale du Dr Larrey, 1830. Dictionnaire des Sciences Medicales. Archives Generales de Medecine. Dictionnaire des Drogues.



Fig. 1.





Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

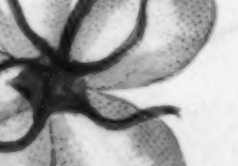


Fig. 6.



SABBATIA ANGULARIS.

Drawn from Nature by W. F. C. Burser.

Tener. Tabular. Botany. 4. 1. 18.

On Sabbatia Angularis. By Daniel B. Smith.

SABBATIA ANGULARIS.

Nat. Ord.—GENTIANEE.

Lin. Meth.—PENTANDRIA MONOGYNIA.

SABBATIA. *Cal.* 5—12 parted. *Cor.* rotate 5—12 parted. *Stig.* 2, spiral, *Anth.* at length revolute. *Caps.* 1 celled, 2 valved.—*Nuttal.*

2. *S. Angularis.* Stem quadrangular, somewhat winged; leaves ovate, amplexicaul; peduncles elongated, corymbed; segments of the calyx lanceolate, much shorter than the corolla. Hab. moist meadows. Aug. \oplus and ♂ . A foot high, branched, fl. rose-col.; seg. obovate.—*Torrey.*

The natural family of the gentianeæ, so remarkable for the bitter principle which is secreted in the leaves and roots of the greater part of its species, and which is contained in every part of the plant in some, is a striking instance of the uniformity with which a certain general structure and appearance in plants is accompanied by similar qualities in their secretions. The various species of *Gentiána*, the *Fraséra*, *Menyanthes*, *Chironia*, *Erythrœa*, *Spigelia* and *Sabbatia* are all distinguished either for their tonic or vermifuge virtues, and form an invaluable portion of the materia medica.

The *sabbatia angularis* is not inferior to any of the family in the purity and intensity of its bitter principle, and deserves the particular attention of American practitioners, from the abundance in which it grows throughout the middle and southern states.

This plant was described in the *Species Plantarum* under the name of *chironia angularis*, and was called centaury by the English from the similarity of its properties to those of its European congener the *erythrœa*, (*chironia*) *centaurium*. It was separated from this genus by Pursh, and joined to the

genus *sabbatia* of Adanson; a change which has been sanctioned by succeeding botanists.

The following botanical description of this plant is given by Dr W. P. C. Barton in his Medical Flora. "The root is annual; it consists of a few thick yellowish white fibres, and sends up a single stem, (rarely two), simple below, but very much and regularly branched above. The stem is herbaceous, from one foot to eighteen inches high, smooth, four sided, with membranous wings at the angles. The branches are axillary and of a similar structure. The leaves are opposite, ovate, acute, closely sessile, or nearly amplexicaule, three nerved. They vary, however, in being longer and narrower. The flowers are very numerous, growing at the extremities of the branches in numbers from two to five, are of a beautiful rose-red colour above, much paler and nearly white in the centre underneath, which gives to the buds a white appearance. In the centre of the corolla there is a defined, pentangular star of a rich yellow colour, bordered with green. The petals are obovate, and vary in being narrower, sometimes nearly lanceolate-obtuse. The calyx consists of five narrow acute or almost subulate segments, little more than half the length of the corolla. The anthers are spiral, of a rich yellow colour. The plant is in full flower in July."

The *sabbatia* grows plentifully in low and moist grounds. In wet summers it is found abundantly in neglected fields, a circumstance which has probably given rise to the prevalent opinion among the country people, that the plant makes its appearance once in seven years. Every part of the plant contains a very pure and intense bitter. It is certainly preferable to the European centaury, the flowers of which are nearly tasteless, while the leaves are in no respect superior to those of the *sabbatia*. Its active virtues are yielded both to alcohol and water, and it may be used advantageously in the form of an extract. It is received into the officinal list of the American Pharmacopœia, although no formulæ for any of its preparations are given.

The preparations made from the erythræa centaurium may be advantageously imitated with the sabbatia.

Extractum Sabbatiæ.

R Herbæ sabbatiæ recentis ℥j.
 Aquæ ℥vj.

Digest for twenty-four hours, then boil for a quarter of an hour, press out the liquid, and evaporate with a gentle heat to the consistence of an extract.

Extractum Alcoholicum Sabbatiæ.

R Herbæ sabbatiæ recentis ℥j.
 Aquæ ℥v.
 Alcoholis diluti ℥ij.

Digest with a gentle heat for three days in the alcohol, and press out the liquid, then boil the herb in the water for a quarter of an hour, and evaporate the expressed liquid; towards the end of the evaporation add the alcoholic tincture, and continue a gentle heat until it is reduced to a proper consistence.

Tinctura Sabbatiæ.

R Herbæ sabbatiæ 3iv.
 Alcoholis diluti ℥ij.

Digest for six days and filter.

Infusum Sabbatiæ.

R Herbæ sabbatiæ 3vj.
 Aquæ bullientis 3vj.

Digest in a covered vessel and strain.

Decoctum Sabbatiæ.

R Herbæ sabbatiæ 3j.
 Aquæ ℥j.

Boil for a quarter of an hour and strain.

*Notice of Iron found in the Powder of Cinchona Bark.
By Charles Ellis.*

A circumstance occurred with a highly respectable house in Baltimore, to which we are indebted for a knowledge of an accidental impurity in the powder of cinchona, which is believed to be of sufficient importance to interest the readers of the Journal.

An ounce of calisaya bark *in powder* was procured of them, and directed by the physician to be made into a decoction. The liquid when decanted was nearly the colour of ink. A second ounce was obtained and infused in an earthen vessel, with precisely the same result. The conclusion was, either that the bark or the water contained iron; and to determine to which of these causes to assign this change of colour, and to ascertain whether the bark were really impure, these gentlemen submitted it to the following experiments, viz. 1. A small quantity of the powdered bark was examined by the aid of a microscope, and the whole surface found studded with small metallic specks, some black, some bright, giving it quite a lustre. 2. A quantity of the powder was boiled in a Florence flask with distilled water. The decoction was of a deep black colour, taste similar to ink and entirely devoid of the sensible properties of a decoction of pure cinchona; suffered to stand, the supernatant liquor was of a grayish blue colour, and the precipitate of a dark brown, approaching to black. 3. A quantity of the powder was exposed, in a shallow vessel, to a stream of water, so as to wash away the lighter particles, and the deposit left in the bottom of the vessel consisted of small black grains of a metallic lustre. The inferences drawn from these experiments were, that the powder contained a metallic substance which proved to be iron; and that the precipitate in the decoction was owing to the action of the components of cinchona upon the iron.

These results led to an examination of other parcels of powdered bark, and in upwards of twenty different samples examined by my friend John Farr, and a number by myself, there were none in which the magnet did not detect minute particles of iron ; in some much fewer than in others.

In order to ascertain the amount of impurity in a given quantity of bark, I washed carefully half an ounce of the same lot used in Baltimore, and obtained one grain of iron in a metallic state : there was perhaps from a fourth to half a grain lost in the operation. From one ounce of another parcel there was half a grain separated by the magnet.

It will be readily perceived, from the nature of this admixture, that it was entirely accidental, and fortunately not of a character calculated to do any injury.

Inquiry having been made of the powderer, it was ascertained that his machinery does not materially differ from that in general use ; that the revolving stone is shod with iron, and passes over a cast-iron plate—a sufficient cause for the existence of minute particles of iron in the powder, particularly as in this instance the bark was not dusted, a process by which the impalpable powder is separated from the heavier and coarser particles.

Although it is not probable that the quantity of iron found in this cinchona would render it objectionable in many cases, still it is desirable at all times to have our remedies free from all foreign admixture—that the physician may know precisely what he is directing, and the patients may neither be alarmed nor disgusted with unexpected, and to them unaccountable changes. From the well known hardness of the French burr stones, we may readily conclude that bark might be ground by them without the fear of adulteration.

It may be observed, in passing, that barks, roots, &c. of nearly every kind, are more eligible for decoction or infusion when coarsely powdered, or bruised, as it is technically called, than when reduced to an impalpable powder.

On Aromatic or Spiced Syrup of Rhubarb. By Elias Durand.

Dr Coxe, in the last edition (1830) of his American Dispensatory, has very judiciously observed that this syrup, prepared agreeably to the Pharmacopœia of the United States, possesses a defect which may be easily obviated, without changing the proportions of its ingredients. In fact, evaporating to one half an infusion of rhubarb and aromatic substances is quite inconsistent with the present improvements in pharmaceutical manipulation; it is too well known that these articles lose by ebullition a great portion of their active properties.

This fault, as well as many others which have crept in that national work, has not escaped the attention of our practical pharmacutists. From the first time I had to compound the aromatic syrup of rhubarb, this defect struck me, and I amended the formula by the following, which undoubtedly affords a preparation very superior to the other, both in nicety and activity. I first prepare an alcoholic tincture with the rhubarb and the aromatic ingredients, and then form my syrup by the addition of a relative quantity of simple syrup.

Aromatic Tincture of Rhubarb.

R Rhubarb of good quality	parts v.
Cloves and cinnamon, of each	parts iv.
Nutmegs	part i.
Alcohol of 20°	parts lxiv.

Bruise the ingredients and macerate them for about a week.

Aromatic Syrup of Rhubarb.

R Aromatic tincture of rhubarb	part i.
Simple syrup of 35°	parts iii.
Mix well. This syrup marks 28° on Baume's pèse syrup.	

Selected Articles.

On the Fermentation of Opium applied to the Extraction of Morphia. Read at the Royal Academy of Medicine, Section of Pharmacy, by A. Blondeau, Pharmacien.

[We have already published such short notices of this gentleman's method of separating morphia as came to hand in the French periodicals. We find in the *Journal de Chimie Medicale*, &c. for February, an account of the process fully detailed, accompanied by a report on the comparative merits of this process and others, made by a committee of the academy, viz. MM. Guibourt and Robiquet. We shall give the whole of it a place in our Journal, as the experiments and observations of these distinguished chemists must prove interesting on the subject of opium, which may be considered as still unsettled and open to investigation.]

M. Blondeau observes of his process, that it offers the advantage of affording a larger product, but that it is to be considered as only preliminary to the extraction of morphia, it being always necessary to complete the operation by one or other of the methods proposed by preceding chemists. For this purpose he selected that by acids, observing at the same time that, in the different experiments, he had procured results nearly as advantageous by following exactly the plan proposed by his colleague and friend M. Hottot.

Process.—Select the best opium, divide it conveniently, and introduce it into a vase with a large opening; cover this with twice its weight of warm water, in a portion of which a

small quantity of the yest of beer and honey have been introduced.

Fermentation is soon established in this mixture when placed in a stove heated to 20 or 25° Cent. This terminates at the end of eight or ten days, and the liquor exhales a well pronounced alcoholic product. This is squeezed through a linen bag, and the residue washed several times and then expressed.

These liquors, when reunited, are reduced by evaporation to a proper quantity, and when cold a slight excess of ammonia poured in. The precipitate, after being washed in cold water and dried, is to be powdered and treated with water slightly sharpened with hydrochloric acid. This liquid assumes a brownish yellow colour, and when, after some hours of contact, the saturation is complete, and the colour is no longer deepened, it must be filtered and evaporated until it assumes the form of a tolerably solid mass on cooling. This hydrochlorate of morphia is considerably coloured, but washed with cold water on linen, and heated afterwards with boiling water and animal charcoal, it crystallizes in silky needles of a beautiful pearly-white colour. We obtain the morphia from this hydrochlorate by pouring into its aqueous solution a slight excess of water of ammonia. The morphia is precipitated in the form of a granulated powder, of a light umber shade, but which dried with care presents the appearance of crystals, the brilliancy of which is apparent when exposed to the rays of light. Morphia thus obtained is very pure, and can be employed for all medicinal purposes; it is, therefore, unnecessary to crystallize it by means of alcohol, more especially as in this form it is much more soluble in acids, owing to its slight cohesion.

The same opium has been treated, for the sake of comparison, by the process of MM. Henry and Plisson, and that above detailed, and the quantity of morphia extracted by the latter, has always been greater than that furnished by the former, in the proportion of eight to five. These are the

mean proportions of many comparative operations. M. Blondeau observes that the advantages resulting from this modification are sufficient to render it worthy of notice, since the expense of the operation is not augmented, and the length of time necessary to complete it but little increased.

How does fermentation act in this case? I am induced to believe, he observes, it is by the resin, extractive, or other colouring substances of the opium undergoing such a decomposition that they are incapable of retaining afterwards the morphia with any degree of force. Thus disengaged, it can be separated with much greater facility; and we obtain probably the whole of that which exists in the opium, whilst by the ordinary processes a part of the alkali remains dissolved in the liquors and cannot be isolated. It is this which occasions the difference of the product in the two cases.

Report made to the Royal Academy of Medicine on a process proposed by M. Blondeau for extracting Morphia. By MM. Guibourt and Robiquet.

As this report is long, we shall take the liberty to condense it as much as may be consistent with clearness. These gentlemen observe that there may be said to be a good and a bad side to each of the methods proposed as modifications of that originally suggested by Sertuerner for the preparation of morphia; and that by practical skill in any one of them, it is possible to derive advantages from it which the others do not afford. The greatest difficulty is to separate the morphia from the colouring matter which accompanies it, without sacrificing a considerable quantity of the alkali. But whatever may be the mode of precipitation employed, it is always possible to separate the last portions by recourse to certain *tours de mains*, sleight of hand, or practical skill, which is the peculiar property of adepts. To obtain a method by which *all* should be able to secure this base,

pure and without loss, has been the object of MM. Hottot, Blondeau, Girardin, and more recently M. Fauré.

M. Hottot proposed so to add ammonia, as only to saturate at first the excess of natural acid in the solution of opium. By this means a great part of the resinous colouring matter is precipitated, which being separated, a second precipitate may be obtained, consisting of morphia, so disengaged from foreign matters that it may be rendered nearly pure by simple solution in alcohol. It is obvious that by this means the first part of the operation is very much advanced; but the difficulty is only postponed, not removed, for the morphia contained in the first precipitate is so involved with a large portion of colouring matter, which increases the solubility of it, that it is necessary to subject it to repeated purifications, always expensive.

M. Girardin, after obtaining the impure morphia by the process of Sertuerner, washed it in weak alcohol, afterwards dissolved it in diluted sulphuric acid, and purified it again by alcohol and ether. We have not repeated this process, but can pronounce, *a priori*, that a portion of morphia is lost in the alcoholic washing, and another quantity in the solution in sulphuric acid. The general rule, from which we cannot depart with impunity, in this kind of operations, is to multiply as little as possible the solutions and washings. Who does not know, in fact, that salts with an organic base suffer, even when they are pure, a very considerable loss, whenever they are dissolved with a view to fresh crystallization. The same observations apply to the method proposed by M. Fauré. This young chemist obtained an aqueous extract of opium, which he redissolved in water, and again evaporated, until he procured a product entirely soluble in water. To effect this object generally requires five solutions and evaporations. The object of M. Fauré is by this means to deprive the opium of all the resin united to the narcotine, a combination he denominates "*resinate of narcotine*," and which he believes forms the insoluble residue

after each aqueous solution. But suppose even that it may be so, and that there is no morphia in the residue, where is the manufacturer who would wish to risk the chances inseparable from a similar series of operations?

One of our most celebrated chemists, Proust, has said that every protracted operation terminates badly, and every day confirms the disagreeable truth as respects organic matters*.

We will now examine the process of M. Blondeau, and endeavour to see if it presents the same inconveniences. Desiring, in the first place, to ascertain the effects of fermentation on opium alone, we took three pounds of very beautiful opium, cut it into very small pieces, mixed it carefully, and then divided it into three equal parts. The first pound, treated with cold water in the ordinary manner, afforded eight ounces five gros of extract, entirely solid and brittle. The residue was glutinous and odorous, and collected as carefully as possible and dried, weighed five ounces two gros. The second pound was dissolved in eight pounds of hot water, to which was added four ounces of the yest of beer, and the whole subjected to the heat of a stove and in an apparatus proper to secure the fermentation.

A considerable quantity of carbonic acid gas was evolved, and notwithstanding the liquor was pressed, filtered, and distilled, it furnished no traces of alcohol. The extract dried weighed nine ounces one gros; the residue, reduced to dryness, weighed six ounces one gros, of which about two ounces belonged to the yest that was added.

The third pound of opium was dissolved as the preceding, and exposed for eight days in the same stove. No carbonic acid was disengaged, and the liquor filtered and evaporated produced nine ounces and a half of extract. The residue had lost all tenacity, and weighed, dry, four ounces three gros.

Finally, four ounces of yest mingled in two pounds of wa-

* For M. Fauré's process see our last number.

ter were enclosed in the same stove and in a similar apparatus for eight days, but the lime water designed to absorb the carbonic acid was not sensibly affected.

It results from these experiments that no carbonic acid is evolved from yest alone, dissolved in water and exposed to heat; and that a simple solution of opium in water, exposed to heat, does not afford any carbonic acid gas.

But that opium and yest mingled in the same solution, disengage a considerable quantity of this gas, though no trace of alcohol could be detected by distilling the liquor. Are we to suppose that this product is completely converted into acetic acid; or must we conclude that opium contains no sugar, and that the yest has been able to act on some other principle of this narcotic? This point we are unable to decide.

Another consequence of the fermentation of opium, or of its prolonged immersion in water, and which appears to be independent of the action of yest, is the complete destruction of the tenacity of the residue, its diminished weight, and the relative augmentation of the soluble matter or extract. Thus opium alone, treated cold, produces but eight ounces five gros of extract; opium and yest nine ounces one gros, and opium fermented *alone* nine ounces four gros. This relative augmentation remains after dissolving the three extracts in cold water. Thus the first is reduced to seven ounces seven gros sixty grains, soluble matter; the second to eight ounces three gros twenty-four grains; the third to eight ounces five gros.

Precipitation by Ammonia.

The three preceding extracts were each dissolved in nine pounds of cold water, and into each one gros of liquid ammonia was poured, which at first occasioned a slight disturbance. But the first and the third became clear again by agitation; whilst in the liquor, No. 2, was formed a black glutinous matter, reduced by exsiccation to half a gros. No

account was taken of it in the following results, but it certainly contained a small quantity of morphia.

The three liquids brought to the same point, were each precipitated with an ounce of ammonia. After the lapse of two days they were filtered, acidulated with sulphuric acid, concentrated, and precipitated again. These are the results :

	1st Precipitate.		2d Precipitate.		Total.	
	Gros.	Grains.	Gros.	Grains.	Gros.	Grains.
No. 1. Opium not fermented,	27	12	00	48	27	60
No. 2. Opium fermented with yeast,	29	48	00	120	31	24
No. 3. Opium fermented alone,	27	00	00	48	27	48

The last precipitates were very much coloured, and were not added to the first, though it is necessary to estimate them in order to ascertain the total amount of impure morphia that opium yields. We may remark that the extract No. 3, the most abundant of all, in consequence of the disappearance of the insoluble matter of opium, was that which furnished the least morphia. From which it appears that this insoluble matter does not transform itself into morphia, as some have supposed, but that it may be made to dissolve with the other principles of opium by the agency of heat and time. It is probable that the explanation of the increase of morphia in No. 2, given by M. Blondeau, may be in part correct, viz. that the resinous portions and other colouring matters suffer such a decomposition during the fermentation, that they are incapable of retaining the morphia with much force. Nevertheless, we think it very probable, that the acid generated in the process contributes essentially to loosen the morphia from its associations, which certainly is not confined to meconic acid alone. We may also presume that the morphia precipitated by ammonia, from a solution of opium, is not in a free state absolutely ; for we have long known that the addition of an acid favours, singularly, the separation of organic bases, which would not be the case if they were combined perfectly in the original compound with acids.

But the product by fermentation is not so advantageously

large as it appears to be at first, since it disappears, in part, by subsequent purification.

Thus the first precipitate obtained from No. 1. weighed 27 gros 12 grains, and was reduced by purification to 24 gros 16 grains; diminution 2 gros 68 grains.

The first precipitate obtained from opium, fermented with yeast, weighed 29 gros 48 grains, and was diminished by the process of bleaching to 24 gros 48 grains; diminution 4 gros.

But as it would be unjust to judge of M. Blondeau's process by the preceding experiments, which were not conducted with sufficient accuracy, we have submitted a kilogramme of opium to ordinary treatment, and another to that proposed by M. Blondeau. These are the results:

Ordinary process, impure morphia, six ounces four gros. M. Blondeau's process, impure morphia, eight ounces one gros.

The same superiority in favour of the new process is always apparent; but if, as our colleague prescribes, we treat this impure product by hydrochloric acid, and subject it to all the operations necessary to purify it, this advantage always vanishes, and the precise results of the two processes are nearly the same. Convinced, therefore, that the treatment by hydrochloric acid does occasion a loss of the morphia, we have submitted a fresh quantity of opium to fermentation, and purified the product in the ordinary manner. In this way we obtained two ounces four gros thirty-six grains of pure morphia from a kilogramme of opium, whilst the same quantity of opium only furnished two ounces three gros by the ordinary method; making one gros and a half in favour of the process by fermentation to the kilogramme. To which may be added the advantage, that the product by the new process is more easily purified. We therefore think that the process by fermentation proposed by M. Blondeau, but in which we would substitute the purification by alcohol, for the treatment by hydrochloric acid, presents a real advantage. And we have the honour, in consequence,

to propose to the academy to address a vote of thanks to this gentleman for his communication.

We would observe in closing, that some years ago one of us announced having taken advantage of fermentation for the extraction of strychnia.

This plan succeeded perfectly when properly employed; nevertheless, it failed entirely in the hands of other chemists. But there is, without doubt, in this, as in many other operations, a *modus faciendi*, on which success depends.

B. E.

On Kinic Acid and its principal Combinations with Salifiable Bases.

MM. Henry, fils, and A. Plisson, pharmaciens attached to the central pharmacy of the civil hospitals, read a memoir on the subject of the kinic acid and its salts, before the Royal Academy of Medicine, Section of Pharmacy, 18th of July 1829.

It is not our intention to give a complete translation of this interesting monograph; but we shall present a concise view of the researches and results of these distinguished chemists.

Kinic acid may be procured by several processes, but it is necessary, in the first place, to obtain the kinate of lime, viz. reduce over the naked fire, nearly to the consistence of a clear syrup, the reddish liquors which result from the decomposition of the sulphuric decoctions of yellow cinchona saturated with lime. Decant the liquor in order to separate the calcareous sulphate that is formed, and reduce it afterwards to the consistence of a soft extract over a water-bath. This product, abandoned to the open air, frequently assumes the form of a pulpy mass, occasioned by the confused crys-

tallization of the kinate ; but as it is very difficult to separate this salt, it is better to treat this extractiforme matter, while hot, two or three times with the alcohol of commerce. The part insoluble in this menstruum dissolves in a small portion of pure water, and does not interfere, especially if the temperature has been a little elevated, with the formation, at the end of a few days, of a thick granular magma. This strongly expressed and submitted to different crystallizations, furnished the kinate of lime perfectly white and very pure. Fresh crystals may be procured from the mother-waters by proper condensation.

The kinate of lime may also be procured by decolouring the sulphuric decoctions of gray or yellow cinchona with the hydrate of lead. This process may be referred to at length in the 13th volume of the *Journal de Pharmacie*. The excess of lead is to be removed by hydrosulphuric acid or diluted sulphuric acid, added carefully. Lime is then to be added to saturation, the compound filtered, evaporated, and the kinate of lime will crystallize. This mode is more prompt, but a little less economical than the preceding.

It is from the kinate of lime procured by one or other of these processes that the kinic acid is prepared. This acid may be obtained in several modes ; that recommended by M. Vauquelin is very direct, viz. add oxalic acid to a solution of the salt very carefully, until precipitation ceases ; filter and crystallize.

Or, dissolve some kinate of lime in a small portion of water, and add to it, in slight excess, some sulphuric acid, diluted with three or four times its weight of rectified alcohol. Deprive the liquor of sulphuric acid by the addition of baryta or kinate of this earth ; filter and evaporate with a gentle heat. The kinic acid will be procured in crystals very white and very pure.

Or, treat with sulphuretted hydrogen the sub-kinate of lead dissolved in a given quantity of water. After the concentration of the clear liquor, the kinic acid will crystallize,

which must frequently be purified by a second crystallization.

Or, lastly, decompose the kinate of baryta by sulphuric acid, added drop by drop, and evaporate the filtered product. The kinate of baryta can be easily obtained by adding a warm solution of kinate of lime in alcohol of 25° to an alcoholic solution of muriate of baryta. The muriate being in slight excess, the kinate of baryta will precipitate. Wash this salt in rectified alcohol until the muriate is removed, and then dissolve it in pure water.

Kinic Acid.

This acid, when pure, is in the form of crystals, tolerably large, handsome and transparent. Its taste is very acid, not disagreeable, and without any bitterness; the specific gravity at $8\frac{1}{2}^{\circ}$ is 1.637, water being 1. Exposed to the air in a perfectly dry state, it remains unaltered, but dissolved in water, it becomes covered with mould like the vegetable acids. It assumes, when first melted, the form of a colourless liquid, afterwards it decomposes, and a brown matter results with carbonic acid gas, which resembles in its odour the burning tartrates; a light voluminous charcoal remains. When the volatile products of this decomposition are collected, a white substance is obtained in small crystals, that MM. Pelletier and Caventou discovered, examined with care, and pronounced to be a peculiar acid, which they denominated *pyro-kinic*.

Kinic acid is soluble in alcohol and water. It dissolves at a moderate heat in about two and a half times its weight of water, and when boiled in it with fecula for a long time, is converted into sugar. Subjected to the action of alcohol under proper circumstances, a peculiar substance results, which has a great analogy with the tartaric ether of M. Thenard, and which is presumed to be *kinic ether*.

Treated with hot sulphuric and nitric acids it is changed; with the first it furnishes a peculiar green substance, and

then carbonizes; with the second, oxalic acid is the result; and if the proportion of nitric acid be less, a peculiar acid matter is furnished, having some resemblance to the *pyrokinic* acid. Is it an acid more oxygenated?

It forms, with organic and inorganic bases, compounds, for the most part very crystallizable, and in definite proportions. They are denominated kinates.

All the combinations we have made are soluble with the sub-kinate of lead, already noticed by MM. Pelletier and Caventou.

By destructive decomposition one gramme of kinic acid, very pure and dried with care at 100° , gave for 100 parts,

Carbon	34.4320
Hydrogen	5.5602
Oxygen	60.0078

This, according to theory, induces us to consider it as composed of

Carbon	34.1149	2 atoms,
Hydrogen	5.5602	4 atoms,
Oxygen	60.3249	3 atoms.

The atomic weight of this acid will be consequently equal to 477.8342.

Of the Kinates.

These salts are all neutral; one only has been obtained in the state of a sub-salt, but not one hitherto with excess of acid. No double salts have yet been procured, at least in the crystalline form.

All the neutral kinates are soluble in water, less so in alcohol, especially if it is highly rectified; they crystallize sufficiently well for the most part, but always slowly and by spontaneous evaporation. They fuse and dry into a kind of varnish, which is slightly deliquescent, though this does not hinder them from assuming a crystalline appearance. Their taste is very variable, and they are destitute of odour.

The kinates may be prepared by a direct combination of

the base with the acid, or by a double decomposition with the kinate of baryta and a soluble sulphate. In this manner may be procured, in very constant proportions, the kinates of magnesia, soda, potassa, copper, zinc, manganese, quinia and cinchonia. All these are neutral salts, and the authors state that they have performed the most elaborate and exact experiments in the destructive analyses of these salts, in order to ascertain their composition, and proportion of base and acid. From numerous experiments, they observe, made for this purpose, we have ascertained that in this species of neutral salts, 100 parts of acid will saturate a proportion of oxide containing 4.299 of oxygen. This would be double in the salts with a double base (*sels bibasiques*), and one half less in the double salts (*bisels*); also, that in the neutral kinates the quantity of oxygen of the base is to that of the acid as 1 to 14.03. We shall not translate the short account given to the mode of forming, and the composition of these individual salts, as they would have but little interest for the general reader, and would occupy too much of our space. The essential febrifuge salts of the cinchonas, however, are interesting to all of us, and of these we shall say a few words. It is the opinion of these gentlemen that the kinic acid exists in combination with quinia and cinchonia in the cinchona bark. They have even isolated these neutral salts, but not in that state of purity which is desirable to establish the absolute truth of the proposition. They have prepared them artificially :

1. By carefully saturating the kinic acid with pure quinia or cinchonia, recently precipitated in the state of hydrates.
2. By decomposing their sulphates with the kinates of baryta or lime. (It is necessary, in the latter case, to employ alcohol of 32° in order to isolate the sulphate of lime, and the excess of calcareous kinate). Crystals may be procured by evaporating the liquids at a regulated temperature.

Kinate of Quinia.

This salt is very soluble in water, a little less so in highly

rectified alcohol, and possesses a bitterness which strongly resembles that of the yellow cinchona. Its crystallizations are accomplished by a species of white circular crusts, sometimes lightly needle-shaped, but more frequently knobbed; these crusts, dried in the air, remain opake, either efflorescent, or assuming sometimes a horny aspect on the edges.

The neutral kinate of quinia sensibly turns the syrup of violets. When some drops of kinic acid are added to this, the crystallization becomes more needle-form. We have not ascertained if there exists an acid kinate, which is probable.

Note.—In order to prepare this neutral salt, it is necessary to employ materials that are *exceedingly pure*, otherwise the result will be a greenish yellow salt, very difficult to decolourize. The composition of the kinate of quinia is

Acid	100
Quinia	194.2

Kinate of Cinchonia.

This salt is more soluble than the preceding; the bitterness has something more of astringency, and the crystallization is less readily accomplished, as the liquor, thickened to a syrup, remains for sometime without changing its aspect. After several days little radiated tubercles are manifest, which unite and form a mass of needle-shaped crystals in the centre, of a pearly silk-like appearance, on which the air has no action when they are dry. Heat decomposes them entirely, and they indicate all the characters of the salts of cinchonia. Composition,

Acid	100
Cinchonia	165.4

In order to determine the composition of these kinates, the authors pursued an indirect mode, which furnished very accurate results. Knowing, in the first place, the composition of the kinate of baryta, and the sulphates of quinia and cinchonia, they valued very exactly the proportion of the

sulphate of baryta formed by the reciprocal decomposition of these salts. The weight of baryta being known, they deducted that of the kinic acid and sulphuric acid combined with the quinia or cinchonia, whence it is easy to arrive by calculation at the analysis of the kinates with organic base. Thus, according to the general laws which govern the reciprocal decomposition of salts, 100 of dry sulphate of quinia give

Sulphuric acid	9.85
Quinia	90.15

which will produce sulphate of baryta 28.94, or of baryta 19.09, and represent kinic acid 46.4, to saturate the above quantity of quinia.

Ten parts of kinate of quinia correspond with 7.3 of neutral sulphate of quinia, for the proportion of alkaloid, and ten parts of kinate of cinchonia with seven of the sulphate of the latter base.

The authors conclude this interesting memoir by some speculations on the probable superiority of the kinates of these alkaloids over the sulphates, hydrochlorates, &c. They state that an equal quantity of quinia will prove more efficacious, united with the kinic than with the mineral acids. 1. Because the kinate of quinine exists in the Peruvian bark. 2. Because the chemical action of the kinic acid on the quinia is not so powerful as the others, and, therefore, it furnishes a salt in which the alkaloid is in its greatest degree of force. 3. Because the kinic acid saturates more feebly the febrifuge virtues of the quinia than the sulphuric and other mineral acids. They support this opinion by the assertion of Dr Bailly, who conceives he has established by numerous experiments the superiority of morphia combined with acetic over that combined with sulphuric acid. 4. Finally, they conceive their judgment will not prove erroneous that the kinic acid is better calculated than any other, to give quinia the capacity for developing its highest degree of medical action. (We should be very

glad to have an opportunity of exhibiting quinia in combination with the acid which nature has joined to it in the cinchona bark. As the sulphate so frequently disappoints us, our apothecaries would do well to procure some of the kinate.) B. E.

A Botanical Notice of the different Genera and Species whose barks have been confounded under the name of Cinchona. By Prof. Decandolle. Translated for the Journal of the Philadelphia College of Pharmacy, from the Bibliotheque Universelle, (vol. 41. p. 144,) by John H. Griscom.

Whenever a name has become illustrious, all who have the least right hasten to assume it; whenever one portion of the earth becomes celebrated for the quality of its productions, all the neighbouring proprietors are anxious that their territory should belong to this quarter. Thus it has happened with the cinchonas. After the celebrity of this bark had become established, all the febrifuge barks of America were, by degrees, endowed with the name of cinchona, and every traveller who discovered a shrub somewhat analogous to the genus cinchona, was desirous that the species should appertain to a genus upon which public attention was so much disposed to dwell. More attentive observation, however, has shown that a great number of substances, more or less different, has been collected under the name of cinchona, and although many of these errors have been partially removed, it will probably not be uninteresting in this place to take a hasty survey of the true cinchonas, and of the substances improperly confounded with them.

This examination may be somewhat interesting, not only

because we shall obtain a more precise knowledge of the objects about which we are continually speaking, but also because a more exact knowledge of these plants may illustrate the *materia medica*. We shall find in this review a memorable example of those affinities of properties which the species belonging to neighbouring genera present, and which go on increasing in the species of the same genus; we shall here see how necessary it is to notice with precision the substances whose analyses have been given by chemists, or with which physicians make their experiments, for without this precision in nomenclature the greater part of other labours is rendered inaccurate, and loses much of its utility.

It is well known that the Peruvian bark has been employed in America as a febrifuge from the earliest period; but that it was not known to Europeans prior to the year 1638, the time when the countess of Cinchona, wife of the viceroy of Peru, was cured of a fever by this medicine, and made it known in Spain, where it obtained the name of the *Countess's powder*, which the public gave to the pulverized bark, and that of *Cinchona*, which botanists bestowed upon the tree which produces it. But although the use of this medicine has spread far and wide, a century elapsed before any particulars of the tree which bears this precious bark became known. It was not until 1738 that La Condamine published in the *Mémoires de l'Académie de Paris*, the description and figure of this tree, which he found in the suburbs of Loxa. Since that time MM. Ruiz and Pavou, in their voyage to Peru; M. Mutis in his laborious excursions around Santa Fé de Bogota; MM. de Humboldt and Bonpland in their admirable tour in America, have brought to light many species of cinchona, and have thus proved that the bark denominated Peruvian, is not obtained from a single tree, but from many proximate species. Soon after, analogous researches made in the Antilles by Badier and Richard, in Brazil by MM. de St Hilaire and Pohl, in the Indies by

Roxburg and Wallich, proved that vegetables very like the preceding existed in different countries, and were often confounded under the same names. We now reckon no less than eight genera which have been mingled under the name cinchona, and these genera contain forty-six species, of which all the known barks appear more or less endowed with febrifuge powers. We shall endeavour to point them out succinctly; remarking, in the first place, that all these genera appertain to the extensive family of Rubiaceæ, and to the tribe of this family which bears the name of Cinchona, and which is characterized, 1, by its fruit having two cells, dehiscent, and polyspermous; 2, by its seeds edged with a membranaceous wing. They are all trees or shrubs with opposite leaves, furnished with intermediate stipules, and a corolla in form of a funnel or saucer, always having five lobes and five stamina.

I. *Cinchona*.

The first rank in this enumeration properly belongs to the true genus cinchona. It is very readily distinguished, 1, by its stamina being entirely concealed in the tube of the corolla, and never projecting; 2, by two little pods adhering to the calyx, which compose the fruit, separating from below upwards, by the doubling, in a singular manner, of the partition which divides the capsule into two compartments; 3, by the seeds being erect and imbricated from below upwards; 4, by the border of the calyx being toothed one-third or half its length, and rising to the top of the capsule. There are at present sixteen known species which belong to this genus, but it is said that Peru and Colombia, of which countries they are all natives, contain a much greater number, which have yet been observed only by Mutis; and it is known that the immense labours of this philosopher are yet unpublished. Those of which I shall here speak are known by authentic specimens, either of flowers and fruits, or of barks, which are obtained from the

very authors who discovered them, a very important circumstance, which I hope will give some precision to this work.

The greater part of the cinchonas have the external part of the flower hairy, and all the species truly important in a medicinal view belong to this division of the genus; such are,

1. *Cinchona condaminea* (Humb. Pl. Equin. Vol. I.) which grows near Loxa, where it is known by the name of *cascarilla fina*, or *quinquina de Loxa*. Its bark is rolled, gray without, with a yellow tinge within, and there flows from it during the life of the plant a yellow and bitter juice. This is the kind which passes for the most energetic of all. Its infusion may be known, according to the researches of M. Vauquelin, by its precipitating isinglass in large flakes; it precipitates likewise galls, tartar emetic, and the acetate of lead. It is frequently confounded in Europe with the other cinchonas of a gray colour, which are of an inferior quality. This species, discovered by La Condamine, and found again by Humboldt, is wanting in the Flora of Peru, but I found it in a herbal sent by M. Pavou to MM. Dunaut and Moricaud, under the name of *Cinchona vritusina*, and a variety with large leaves under that of *C. chahuarguera*. These are probably two common names of this plant in Peru.

2. The *Cinchona scrobiculata* (Humb. Pl. Equin. pl. 47.) grows near St Jean de Bracomoros, where it bears also the name of *Cascarilla fina*. Its bark is of a reddish brown, and is one of those which are named *red cinchona* in the pharmacopœias; its juice is yellow and astringent. It passes for one of the better kinds, but is less common than the following. Its infusion, according to M. Vauquelin, precipitates isinglass, tartarized antimony, and tannin, but reddens the tincture of turnsole. This kind appears to have been mingled with the following in the Flora of Peru. I have received from M. Pavou a bark very much like this under the name of *Cascarilla colorada*.

3. The *Cinchona lancifolia* (Mutis) grows in the cool parts

of the Andes ; its bark is gray without, and of an orange yellow within. It is this which produces principally the *orange cinchona* of the European pharmacopœias. It is impossible that there should be two distinct kinds confounded under this name. The *C. nitida*, *lanceolata*, and *angustifolia* of Ruiz are cited here as simple varieties. The *Cascarilla lampinio* and *amarilla de munna* of Spanish America are likewise included in it.

4 The *Cinchona pubescens* (Vahl. Act. Soc. Hafn. V. I. pl. 2.) grows at the foot of the Andes in Peru, and on the mountains of New Grenada. It is easily recognized by its leaves being hairy beneath. Its bark is yellow externally, and it goes by the name of *yellow cinchona* in the European pharmacopœias. Its infusion is of a golden yellow, and becomes green by sulphate of iron. It precipitates tartar emetic and nitrate of mercury. This species was discovered by Joseph de Jussieu in 1738, and has received different names, such as *C. cordifolia*, Mutis ; *C. officinalis*, Gærtner ; *C. pallescens*, Ruiz ; *C. hirsuta*, Fl. Per. &c. It is one of the most extensive. The barks known by the names of *Cascarilla pallida*, *Quina amarilla*, belong to this species. The *Cascarilla delgado*, or *Cascarilla de pillao*, which is the *C. tenuis* of the quinology of Ruiz, appears to be taken from the very young branches of the variety β of this species, *Cinch. hirsuta* of the Flora of Peru.

5. The *Cinchona purpurea* (Fl. Per. pl. 193.) is perhaps only a variety of the preceding or neighbouring species, distinguished by its leaves being membranaceous and coriaceous, almost glabrous, and by its fruit being rather longer in proportion to its breadth. Its bark is known in America by the name of *Cascarilla bobo de hoia morada*. The *C. morada* of Ruiz, and perhaps his *C. coccinea* are here united.

6. The *Cinchona Humboldtiana* (Ræm. and Schuldt) which is figured in pl. 19 of the Equinoctial Plants, under the name of *C. ovalifolia*, but which is not the one bearing the same name in the "Flore du Pérou" is found near Cuença, but is

not yet known in commerce, although it appears to be of a good quality. I have received some of its bark from M. Bonpland, under the name of *yellow cinchona of Cuença*. It is called at Cuença *Cascar. peluda*.

7. The *Cinchona magnifolia* (Fl. Per. pl. 196.) grows in the forests of the Peruvian Andes, and in New Grenada; it is known there by the name of *Quina roxa*, and of *flor de ahazar*; it is the same as the *Cinch. lutescens* of Ruiz, the *C. grandiflora* of Poiret, and the *C. oblongifolia* of Mutis. Its bark is of an ash-brown without, and somewhat red within; bitter and acidulous. It is little used in Europe, except when mixed with others, and chiefly the red.

8. The *Cinchona macrocarpa* (Vahl. Act. Soc. Hafn. V. I. pl. 3.) is remarkable for its pale bark, whence it derives its name of *white cinchona*. It is not sent to Europe. The other species of this genus are too rarely employed to merit a detail in this place. Among these species there are some whose botanical relations are at the present time well known; such are,

1. The *C. macrocalyx* of Pavou (quinol. edit.), with which I became acquainted by the specimens sent by this botanist to MM. Moricaud and Dunaut. 2. The *C. crassifolia* of Pavou, with which I became acquainted in the same manner. 3. The *C. dichotoma* of the "Flore du Pérou." 4. The *C. acutifolia* of the same work. 5. The *C. micrauha*, which, notwithstanding its vulgar name of *Cascarilla fina*, is little employed. 6. The *C. glandulifera* of the Flora of Peru, or *glandulosa* of Ruiz. 7. The *C. caduciflora* of Humboldt and Bonpland. 8. The *C. rosea* of the Flora of Peru, or *Cascarilla pardo* of Ruiz. 9. Lastly, the *C. pelalba* of Pavou, a beautiful species which I have seen in the Herbarium of M. Moricaud.

Besides these species known to botanists, there is a great number of barks in the different collections, and I have seen, in particular, a beautiful series of them sent to M. Colladon by M. Ruiz; but the trees which produce them are not yet

known, and it is probable that the greater part are obtained from the preceding species, collected at different ages, and in different localities; it is for travellers to clear up these doubts. The majority, besides, appear to Ruiz to be very inferior to the preceding.

Let us observe that quinine and cinchonine are, even at the present time, two products which have been obtained only from the barks of the genus *Cinchona*. The great success of the quinine, and its identity in the different species of cinchonas which are known, tend to diminish the importance of an exact distinction of the species. During the time that the bark alone was given, it was very essential to know which bark should have the preference; but at present the most important thing to understand perhaps is, which bark will produce the greatest quantity of quinine, at what age it yields the most, and whether the wood and leaves might not furnish it as well as the bark; it is desirable that some pharmaceutical chemist should establish in America a manufactory of quinine, in order to supply at a cheap rate the whole world with this valuable drug, and to prevent, perhaps, the extinction of the cinchonas, by employing all those parts capable of furnishing this product. There is reason to be apprehensive for the fate of this precious vegetable, when we consider that it is no where cultivated, and that, besides the use which is made of it in America, there are sent out annually twelve to fourteen thousand quintals of bark. But if the distinction of the species has lost its importance, that of the genera has, on the contrary, increased, since it has been supposed that foreign barks of the true genus *cinchona* have no quinine; a fact, the truth of which ought, however, to be carefully ascertained, particularly with respect to the following genera.

II. *Buena*.

This genus differs from the true *Cinchona*, 1, that the calyx falls after the flowering, instead of remaining at the

summit of the fruit; 2, the tube of the corolla is wide and often a little curved; 3, the capsule opens from above downwards, and not from below upwards; 4, and chiefly, that at maturity the tube of the calyx separates naturally from the fruit to which it adhered. The authors of the "Flore du Pérou" designated this genus (dedicated to Cosme Bueno, a Spanish physician) by the name of *Cosmebuena*, because at that time there existed another genus called Buena; but this having been suppressed, it became convenient, after the example of M. Pohl, to give it the name of Buena, in order to avoid a term composed of the first and last names of him to whom it is dedicated, a sort of composition of words which is inadmissible. We are acquainted with only three species of buena, two from Peru (*B. acuminata* and *B. obtusifolia*), whose barks, although febrifuge, do not form a part of those sent to Europe, and one from Brazil (*B. hexandra*), for our botanical knowledge of which we are indebted to M. Pohl, and a chemical analysis of which has been published in the "Mémoires de l'Académie de Lisbon," (Vol. III. p. 2. p. 96). Its bark is used in Brazil under the name of *China*.

[To be continued.]

Review.

Traité des Moyens de reconnaître les Falsifications des Drogues Simples et Composées, et d'en constater le Degré de Pureté. Par A. Bussy et A. F. Boutron-Charlard. Paris, 1829. Pp. 506, 8vo.

[Continued from page 158.]

Antimony.—The sulphuret of antimony of commerce is always mixed with variable proportions of arsenic, sulphurets of lead and iron, silex, sulphate of baryta, and earthy matters. It is easily freed by fusion from all these foreign substances, except lead, arsenic, and iron, which remain combined with the metallic antimony, prepared from impure sulphuret by the ordinary process. These substances accompany the antimony in various preparations, and it is important to ascertain the purity of the metal. Arsenic may be detected by calcining the metal in a strong heat with tartar. The potassium of the latter forms, with the antimony, an alloy which decomposes water with the disengagement of hydrogen gas. If there be the slightest trace of arsenic, it combines with the hydrogen, and will be detected by the peculiar smell of arseniuretted hydrogen. It may also be reduced to the metallic state by burning the gas in a long tube.

Lead may be detected by treating the metal with a large portion of hot nitric acid, which dissolves the lead, and leaves the antimony in the form of an insoluble white powder.

Evaporate the nitrate to dryness, redissolve in distilled water, and add sulphuric acid till there is no further precipitate; wash and dry the sulphate of lead, 1895.65 grains of which are equivalent to 1294.49 of metal.

The presence of iron may be ascertained by reducing the metal to fine powder, and treating it with nitro-hydrochloric acid, which dissolves the whole. Dilute with water to precipitate the antimony, the last portions of which may be separated by a stream of sulphuretted hydrogen. The iron may then be precipitated by potassa or other reagents.

Borax.—Borax is now manufactured largely in France by the combination of soda with the boracic acid, which exists uncombined in several of the hot springs of Tuscany, in the proportion of nine grains to the pint. The native borax of Tibet contains a portion of organic fatty matter; it melts into a brown glass, and yields a boracic acid in large brilliant scales. The manufacturers of artificial borax communicate to it all the properties of the native by combining with it a portion of fatty matter.

Borax often contains pieces of alum which may be detected by the taste.

Catechu.—This extract is obtained by boiling the legumes and wood of the acacia catechu.

A sophisticated catechu has latterly been seen in the French market. It is divided into small uniform cubical pieces, larger than those of litmus, having the external colour of catechu, but of a dull, brown and granular fracture. This catechu contains a great proportion of fecula, which may be detected by reducing it to powder and treating with successive portions of cold water and alcohol. Nearly all the catechu will be dissolved, and the fecula alone remain.

Carbonate of Lead.—To examine the purity of white lead, dissolve 100 grains in weak nitric acid, and evaporate to dryness. Then add a sufficient quantity of distilled water to dissolve all the nitrates that have been formed, and wash and filter the residue. Dry this and weigh it carefully, and we

shall have the weight of the two substances most commonly mixed with white lead, viz. sulphate of lead and sulphate of baryta. To separate these, boil them in a great excess of hydrochloric acid, decant the clear liquid, and repeat the operation twice or thrice with fresh acid. The sulphate of lead will be dissolved, and the insoluble part is the sulphate of baryta, the weight of which can be ascertained. To ascertain the quantity of carbonate of lead, pass a stream of hydrosulphuric acid gas through the nitric solution till it is in excess. Wash and dry the precipitate, 1495 grs of which are equivalent to 1294 grs of lead and 1670 grs of carbonate of lead. To determine the quantity of carbonate of lime, free the last remaining liquid from hydrosulphuric acid by a little heat, and add carbonate of ammonia, which will precipitate the carbonate of lime.

Castor.—There are regular establishments for the adulteration and imitation of drugs at Marseilles, and castor is manufactured by these ingenious sophisticators. The false castor is in larger and rounder bags than the true, but little wrinkled, and when opened, not exhibiting the traces of membranaceous partitions. The false castor is sometimes soft and sometimes brittle, of a semitransparent red colour, having a faint smell of castor, and forming a lighter coloured powder. It is almost entirely soluble in alcohol and ether.

Chlorate of Potash.—This salt is liable to be mixed with chloruret of potassium, and may be purified by dissolving in boiling water. The chlorate crystallizes upon cooling, and leaves the chloruret in solution.

Chromate of Lead.—This pigment has been adulterated with the carbonates of lead and lime. These impurities may be readily detected by their effervescence with acids. The most prevalent adulteration is the sulphate of lime, which imparts a lightness and a velvety lustre to the chromate that are looked upon as proofs of good quality.

Whether this sulphate has been mixed at the moment of precipitation, or subsequently added by the vender, it is diffi-

cult to detect it at first sight. It may, however, be known by the white specks irregularly diffused through the mass. It is best always to test its presence; for this purpose calcine four parts of chrome with one part of finely powdered charcoal in a covered crucible. Treat the residue with weak hydrochloric acid, which decomposes the sulphuret of lime formed by the calcination, and disengages sulphuretted hydrogen gas. Filter the liquid and add a sufficient quantity of water of ammonia to precipitate all the bases but lime; filter again, and add oxalate of ammonia, which will throw down the lime in the shape of an oxalate. The chrome has sometimes been adulterated with starch, which may be detected without difficulty by calcination.

Chromate of Potassa.—This salt is capable of combining with other neutral salts, especially with the sulphate of potash, and forming triple salts with them. The rich colour of the chromate pervades the compound, and renders it difficult of detection by the eye. In a specimen analysed at Paris there was found 56 per cent of sulphate of potassa.

To detect this falsification pour a solution of this salt into a solution of nitrate of baryta until there is no further action; chromate and sulphate of baryta will be formed and precipitated. The chromate readily dissolves in nitric acid, by which means it can be separated from the sulphate, and the quantity of the latter ascertained.

Wax.—Wax is frequently adulterated with potato starch. To detect it dissolve the wax in oil of turpentine, and weigh the insoluble residue.

Copaiva.—This resin is often adulterated with castor oil. To ascertain its purity, mix in a stoppered bottle one part of water of ammonia at 22° with three parts of copaiva, and agitate the mixture. If the resin is pure the mixture becomes transparent in a few minutes, but if mixed with oil it remains opaque. This experiment should be performed at a temperature below 60°, and will readily show the presence of five per cent of oil.

*Bark of the Pomegranate Root (punica granatum).—*The use of this bark, which was noticed by Pliny and Dioscorides, has lately been revived as an anthelmintic. - This bark is of an ash gray colour on the surface, yellowish in the interior, and of a slightly acrid and astringent taste, without decided bitterness. Its fracture is smooth, and it colours the saliva of a brownish yellow. In commerce it is sometimes mixed with the bark of the barberry bush (*berberis vulgaris*), which bears a strong resemblance to it in appearance. The taste of the barberry bark is, however, bitter without acidity or astringence; its fracture is fibrous, and it divides, when chewed, into woody filaments; it colours the saliva of a clear yellow; its external colour is gray, its internal a strong yellow.

The salts of iron have no action on an infusion of the barberry, but give to the infusion of the pomegranate bark an intense violet black colour.

Canella Alba.—Winter's Bark.—These barks so closely resemble each other, that the former is universally substituted for the latter. It is more easily obtained, and is more fragrant and agreeable. The colour of the former is a pale orange yellow, of the latter a reddish gray. The fracture of the one is smooth, gray towards the surface, and red internally; that of the other granular, marbled with red and gray, and presenting several shades of colour. The infusion of the canella is of a straw yellow, and unaltered by nitrate of baryta and deuto-sulphate of iron; while that of Winter's bark is of a reddish brown colour, and nitrate of baryta and deuto sulphate of iron occasion precipitates in it, the latter of a black colour.

Sulphuric Ether.—An essential condition for obtaining ether of a fine quality, is to prepare it from rectified spirits of wine. That which is made from alcohol of grain or fecula has not so sweet and agreeable an odour as the other, and betrays, when evaporated on the hand, the peculiar and

offensive odour which may be distinguished in all the preparations from those alcohols.

Guaiacum Wood.—This wood, which is generally sold in the form of raspings, is frequently mixed with box and other hard woods used in the turners' shops. The true wood may be known by its tincture becoming milky when mixed with water, and of a beautiful blue colour when a few drops are mixed with mucilage of gum arabic. The greater part of the rasped guaiacum sold in America is the wood of the *lignum vitæ* tree (*guaiacum sanctum*), from which, as well as other species of the same genus, guaiacum is obtained.

Gum Tragacanth, powdered.—This powder is often adulterated with powdered gum arabic. In certain proportions the mixture makes a thinner mucilage than the gum tragacanth contained in it would form. The adulteration may be detected by adding tincture of guaiacum in the proportion of five or six drops to two drachms of the mucilage, shaking it continually. If it contain gum arabic it will assume a fine blue colour in a few minutes. By this means five per cent of gum arabic can be detected, although when the proportion is small the change of colour does not take place for two or three hours. Rectified alcohol poured into a filtered solution of gum tragacanth separates light floculæ without disturbing the transparency of the liquid. When mixed with a solution of gum arabic, alcohol renders it opalescent, and if the solution be strong, occasions a precipitate.

Gum Senegal is always mixed in the original packages with a small quantity of bdellium, which may be readily known by its dull, waxy fracture, and its acrid and bitter taste.

Gum Arabic, powdered.—This powder is sometimes mixed with starch and flour. To ascertain its purity drop a little of the powder into cold water and agitate it for a few moments; the gum quickly dissolves and the starch and flour remain at the bottom.

Miscellany.

Salicine or active principle of Willow Bark.—We noticed, in the number of our Journal for April 1830, the discovery of a principle in willow bark by M. Leroux, supposed by him to be alkaline. MM. Gay Lussac and Magendie were appointed by the Royal Academy of Sciences to examine the nature of this product. They satisfied both themselves and the discoverer that so far from being alkaline, salicine is decomposed by acids, and the latter destroy its property of crystallization. It is evident, therefore, that sulphate of salicine could not exist. Salicine is destitute of azote: when pure it is in white crystals, very delicate, and of a pearly aspect, and very soluble in water and alcohol, but not in ether. Its taste is intensely bitter, and its aroma resembles that of the willow bark.

Process. To procure the salicine, boil three pints of the willow bark (*salix helix*), dried and reduced to powder, in fifteen pounds of water, charged with four ounces of carbonate of potash. Filter and add to it, cold, two pounds of liquid subacetate of lead. Filter again, treat it with sulphuric acid, and pass through it a current of sulphuretted hydrogen, to separate all the lead. Saturate the excess of acid by carbonate of lime, filter again, concentrate the liquor, and neutralize it by the addition of dilute sulphuric acid. Decolourize it by animal charcoal, filter while boiling, crystallize twice, and dry it, protected from the light. This operation, which M. Leroux will simplify in all probability, furnished about one ounce of salicine from three pounds of bark. This remedy has been employed as a substitute for sulph. quinia in the cure of intermittent fever, and has been found to answer exceedingly well. MM. Magendie, Miquel, Husson, Bally, &c. have exhibited it, and all agree that from twenty-four to thirty grains are sufficient to arrest the paroxysm of intermittent fever completely—which proves it to be nearly if not quite equal to the sulphate of quinia.—*Journal de Chimie Medicale, &c. for June 1830.*

Sarsaparilla.—At the sitting of the Society of Pharmacy of Paris, June 9, M. Thubeuf stated that the best sarsaparilla is that which furnishes the most extract when properly treated with alcohol and water. He presented to the society a principle that he regarded as the aromatic principle of sarsaparilla. It resides in the greasy matter which is a constituent of this root.

*Notice of Piperin; by T. G. CLEMONS, Member of the Royal School of Mines.
TO PROFESSOR SILLIMAN.*

Paris, Jan. 12th, 1830.

SIR: Whilst occupied in Mr Robiquet's laboratory, I had occasion to prepare, for the demands of commerce, more than usually large quantities of piperin:—I have frequently treated an hundred pounds of piper nigrum at a single digestion.—Thus I had an opportunity of examining the substance, and rectifying certain representations respecting its properties, and I think that the following additions cannot but be of utility to those persons who may have occasion to prepare the substance.

After the analysis given by Mr Peletier, piper nigrum contains a crystallizable substance (piperin), an acrid concrete oil, a volatile balsamic oil, a gummy colored matter, an extractive principle, malic and tartaric acids, amidon, bassorine, lignin, and incidental salts.

By following the methods of preparation heretofore given, I have never succeeded without great pains in separating that acrid resino-oleaginous compound so extremely embarrassing in the course of the purification.

It is evident from inspection that the greater part of the coloring matter exists in the outer pellicle of the grain; all attempts to make the separation by mechanical or other means proved fruitless, and recourse to pulverization was found necessary.

The pepper should be ground, and digested in alcohol at 37° or 40° (Baumé) at a smart distilling heat, an alembic with its water-bath is at once convenient and economical; the whole should be agitated from time to time, and the fluid changed if necessary. I know of no better indication of the entire extraction of the piperin, than the want of taste in the mark, or insoluble residue; although acidity (as has been represented) is by no means a property of piperin. The alcoholic solutions being united, should be reduced over a water-bath. The distillation ended, there will be found in the bottom of the alembic, a deposit composed of a great deal of piperin, and a black acrid resino-oleaginous substance; the separation of this latter compound from the piperin is difficult in the extreme, so much so that I have seldom or never seen the preparation free from acidity, which not only destroys, but produces a contrary effect to that desired when employed as a remedy. The greater part of this viscous oil may be separated by cold alcohol, piperin being much less soluble in this menstruum when cold than when warm, and much less than the oil. The latter portion may be entirely separated by the addition of a little lime to the warm solution of piperin with the oil, and leaving it to crystallize in the same vase, which when cold may be separated at leisure, redissolving the crystals thus procured with addition of a little animal charcoal, and filtering when hot, which upon cooling will afford crystals of a canary white, regular and free from acidity.

Mr Pontel has advised the use of caustic potash, and the effect is certainly very marked. The solution should be weak, for caustic potash has a tendency to alter the nature of the substance, and instead of procuring piperin, I once found a compound that resembled very much that of soap, and all subsequent attempts to procure the substance in crystals failed; moreover I have always observed, that those crystals obtained by the aid of potassa had more or less of a reddish tinge, and were very brittle.

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Piperin, when pure, crystallizes in right square prisms, occasionally presenting an anomaly, the crystals, particularly those obtained through the means of potassa, being hollow, or containing an interior decrement, the four vertical sides being entire, and showing the form of the crystal. Insoluble in water, soluble in cold alcohol, and more so when warm, insoluble in acetic or other acids. It has been employed latterly in Italy as a febrifuge.

If you think the above worthy of being made public, will you have the goodness to give it a place in the next number of your excellent Journal of Science and Arts.—*American Journal of Science and Arts for July 1830.*

Formula.—In foreign pharmacopœiæ and other works of pharmacy we often find formula for combinations, that are entirely unknown to those of our own country. We insert the following from Verey's Pharmacy without any respect to arrangement.

Silk Plaister Cloth.

R.—Isinglass	1 oz. 1 dr.
a Alcohol 22° Baumé	12 oz.
Tincture of Benzoin or of Balsam of Peru	2 oz.
b Tincture of Benzoin	6 oz.
Fine liquid Turpentine	4 oz.

This kind of plaister is applied on white or black silk, stretched on a frame garnished with points. A solution of the isinglass is to be made in boiling water: to this is to be added the alcohol and tincture of benzoin (a) mixed together hot and well filtered. Of this solution a thick coat is to be applied to the upper surface of the silk, by means of a brush or pencil. This coat being dried, five others are to be successively applied; afterwards two coats of the tincture of benzoin (b) and the turpentine. This last application increases its flexibility; and though some pharmacians prefer the tinct. bals. Peru, yet the latter scales off more readily, while it is more agreeable.

Dover's Powders—The following formula for this ancient and celebrated powder is from the French Codex.

R.—Sulphate of Potassa	} each 4 grammes, or $61\frac{76}{100}$ troy grains.
Nitrate of Potassa	
Ipecacuanha in powder	} each 1 gramme, or $15\frac{44}{100}$ troy grains.
Opium purified	
Liquorice in powder	

It is recommended in the pharmacopœia of Swediaur to melt the nitrate and sulphate of potash together in a crucible, and then unite them to the other powders. The dose is directed to be 12 grains.

Cough Lozenges of Tronchin.

R.—Powdered Gum Arabic	8 oz.
Brown Hydrosulphuretted Oxide of Antimony	} each 4 scruples.
Anise	
Extract of Liquorice	2 oz.
Gummy extract of Opium	12 grs.
White Sugar	2 lbs.

Mix and make into lozenges weighing 6 grains each. Of these one may be taken occasionally in diseases of the throat and chest.

Lozenges of Oxalic Acid for thirst.

R.—Pure powdered Oxalic Acid	2 dr.
Sugar	1 lb.
Volatile Oil of Lemons	20 or 30 drops.
Mucilage of Gum Tragacanth	q. s.

These lozenges may be coloured red by means of a little carmine, blue by Prussian blue, or yellow by turmeric if desirable. They are very pleasant in fever. And if it be desirable merely to make an *oleo saccharum*, the mucilage need not be added, and the compounds can be preserved in the state of powder and used to prepare *lemonade*.

Lozenges of Magnesia.

R.—Calcined Magnesia	1 oz.
Powdered Sugar	4 oz.

Mucilage of Gum Tragacanth in orange flower water q. s.

These lozenges are prepared as the preceding.—In the same manner may be formed lozenges of chalk, prepared oyster shells, &c.

Paste of Liquorice, Gum, &c.

R.—Purified Extract of Liquorice	1 lb.
Gum Arabic	2 lbs.
White Sugar	1 lb.
Powdered Orris Root	1 dr.
Oil of Anise or other Volatile Oil	24 drops.

Dissolve the gum in warm water, (q. s.) strain it, and add to the solution the sugar and the liquorice, and liquefy the whole on a sand bath. Then evaporate it to the consistence of a thick syrup, and mix the powder and essential oil with it. The paste is afterwards to be placed in metallic moulds, such as is used for chocolate, and exposed to a temperature of 40° or 50° of C. in a stove, until it is sufficiently dried. It is then divided into little squares, and esteemed expectorant and demulcent.

Jujube Paste.

R.—Jujubes, peeled and selected	1 lb.
Sugar	5 lbs.
Gum Arabic	6 lbs.
Water	30 lbs.

The jujubes are to be pressed in order to open them, then boiled in the water, and afterwards passed through a cloth by expression. With this decoction and the sugar, a concentrated syrup is to be made, which it is best to clarify with the whites of half a dozen of eggs, and strain it when reduced to two-thirds. The gum arabic, clean and bruised, is to be dissolved in part of the water, strained, and thickened by evaporation, and then added to the syrup: the whole to be rendered aromatic with the alcoholic tincture of citrons dissolved in a little water. The syrup afterwards to be poured into moulds, and evaporated to the proper consistence in a stove at a heat of 30° C. The mass obtained should be 9 lbs. If dried too much it becomes as tenacious as horn.

Dabereiner's Glass of Strontia.—We are indebted to the kindness of our friend Dr Lewis Feuchtwanger for some translations from German Journals.

To prepare the above compound—

Take—Sub-Carbonate of Potassa	70 parts,
Sub-Carbonate of Soda	54 parts,
Carbonate of Strontia	74 parts.

These salts melted together furnish a mass of a milky whiteness, which, combined with 224 parts of silex, afford a most beautiful glass, distinguishable from the crown glass by its greater fusibility and specific gravity, and being more refractive than the latter.

Dabereiner's Soluble Glass—Take of

Sub-Carbonate of Potassa	70 parts,
Sub-Carbonate of Soda	54 parts,
Silex	192 parts,

Melt these articles together, and the result will be a beautiful glass of great hardness, soluble in boiling water. When cold this solution is thinner, and less apt to coagulate than that obtained by the formula of Mr Fuch, the discoverer. It may be readily prepared in a platinum crucible over the flame of an Argand's lamp. This compound can be applied to a variety of purposes. It easily penetrates the pores of wood, and renders it incombustible, and may therefore be employed (as it is cheap) to render buildings fire proof. It forms a fine, transparent and elastic varnish, which has no action on ink and may serve beneficially to cover prints, maps, &c.—*Erdman's Journal.*

Sheele's Green.—This substance is a combination of deutoxide of copper and of oxide of arsenic; it is pulverulent and insoluble in water. When exposed to heat, it emits a very strong smell of arsenic; heated in a tube with charcoal, it yields metallic arsenic and copper mixed with charcoal. The Sheele's green is obtained by the following process: boil for half an hour in a sufficient quantity of water eleven parts of white oxide of arsenic with thirty-two parts of subcarbonate of potassa: let the liquor settle, then mix it with a solution of thirty-two parts of sulphate of copper in five hundred and forty-four parts of water. Stir the mixture well, and the Sheele's green precipitates. Drain the precipitate upon a piece of linen and wash it several times in order to separate the sulphate of potassa.

Mr Braconnot has given us the following process for obtaining green as fine as that of Schweinfurt. Dissolve eight parts of oxide of arsenic and eight parts of pearlsh, decompose this solution with six parts of sulphate of copper, and mix the precipitate with three parts of acetic acid.

This green is used in the fabrication of hanging paper and oil painting.—*Dict. des Drogues.*

Method of drying Narcotic Plants for Powders.—Mr Battley has prepared the following rules for drying narcotic plants for powders: The same rules for reviving withered plants must be practised as recommended in the April number of our Journal, page 86. Then the leaves being in a state of high preservation, and entirely freed from the stalks and external moisture, must be laid in thin layers, in baskets made of peeled willow, placed in a drying room, from which the light is entirely excluded. The temperature of this room should be raised to between 130° and 140° F. for three or four hours, or until the leaves begin to shrivel. They are then to be turned, and the same temperature preserved for six or eight hours longer, which will generally complete the process. This fact may be known by the leaves crumbling easily in the hand. When the process has been properly managed throughout, the leaves will be found to retain their green colour in perfection, and consequently their medicinal properties. Oil jars made perfectly clean and dry are found to answer best for preserving them in this desirable condition. The leaves should be placed lightly in the jars; they should then be hermetically sealed, and kept in a dry and warm situation.

The rules suggested by Mr Battley appear to us well worthy of the attention of our apothecaries. Narcotics are an important class of remedies; and as they are so modified by soil, climate, cultivation, &c. it should be an object with our apothecaries not to allow them at any rate to deteriorate in the manipulations to which they subject them.—*Ed.*

La Société de Pharmacie de Paris.—At a sitting of the Society on the 15th October 1829, the secretary introduced as part of the printed correspondence, that M. Elias Durand, formerly pharmacien major to the French armies, now resident at Philadelphia, had addressed, in the name of the College of Pharmacy of that city, several copies of the first two numbers of the Journal which that College is engaged in publishing; and expressed the desire to see the Society of Pharmacy of Paris enter into friendly relations with the College of Philadelphia. This proposition met with a warm reception, and M. the secretary general was charged to give immediate attention to it. M. Chereau was requested to present a view of the principal memoirs contained in the Journals.—*Journal de Pharmacie, Nov. 1829.*

New source of Spirit.—It is stated that the berries of the *Scorbus Aucuparia* are now used in the north of France for the production of spirit, and the result is said to be equal to the purest distillation from grapes for brandy. The perfectly ripe berries are exposed to the cold, then bruised in a wooden vessel, boiling water added, and the whole stirred until the temperature falls to 82° F. A proper quantity of yeast is then added, the materials covered and allowed to ferment. After the fermentation ceases the liquor is drawn over by distillation in the ordinary manner. The first product is weak, and disagreeable in flavour, but, by being distilled a second time, with the addition of eight or nine pounds of finely powdered charcoal to forty gallons of weak spirit, a very superior article is produced. The charcoal should remain in the liquid two or three days before the second distillation.—*Lond. Med. and Surg. Journ. Feb. 1830.*

Estimation of the Vegeto-Alkali in Peruvian Bark.—It is often important in pharmacy to be able to tell the value of a sample of bark, by ascertaining the quantity of quinia or cinchonia which it contains. MM. Henry and Plisson, and also M. Tilley, have published processes for this purpose. Professor Gobel applies the following method to obtain the same end:—Two ounces of powdered bark are acted upon, at successive times, by sixteen ounces of water and one hundred and eighty grains of muriatic acid, specific gravity 1.13, ebullition being occasioned; all the liquids are to be put together, and caustic potassa added, which produces a brown precipitate: this is to be redissolved in dilute muriatic acid, again precipitated, and so on, until the precipitate is quite white; it is then to be dried, and treated with cold strong alcohol, to separate the quinia and cinchona from each other.

M. Veltman has devised the following process, which may be applied to small quantities, is easy of execution, and exact:—Fifty-five grains of the bark in fine powder is to be mixed with an equal quantity of washed siliceous sand, the grains of which are about half the size of poppy seed: this is to be well mixed with five drops of muriatic acid, and twenty drops of alcohol, and pressed lightly into a glass tube four inches and three quarters long, and 0.6 of an inch in diameter, one end of which has been covered with a little piece of muslin, and then inserted into a close vessel. The other end of this tube is to be connected by a bent tube with a small flask filled with a mixture of an ounce and a half of alcohol and twenty drops of muriatic acid; the bent tube should be 0.2 of an inch in diameter; one end should go to the bottom of the flask, the other should reach the surface of the mixed bark and sand. The alcohol in the flask is then to be boiled by a small spirit lamp. It will pass through the tube and extract all that is soluble. If the ebullition is performed slowly, the last drops of alcohol pass nearly colourless. The reddish brown alcoholic tincture is to be precipitated by hydrated lime; after twelve hours it is to be separated by a filter, the liquor is to be rendered slightly acid, evaporated until in a soft state, then dissolved in a hundred and twenty grains of water, and precipitated by a few drops of caustic ammonia. The precipitate being dried, indicates the quantity of alkali in the bark. In this way M. Veltman found that from 3.3 to 6.0 parts of vegeto-alkali were combined in 100 parts of different varieties of bark.—*Bull. Univ.*

Taste of Sulphate of Quinia.—The bitter taste of sulphate of quinia is so strong, that the mixture of one part with one hundred and sixty of sugar still has it sensibly. It is, however, remarkable, that if one part of the same salt be mixed with ten or fifteen parts of the powder of valerian, fennel, anis, orange peel, &c. a mixture is obtained which has scarcely any bitterness. Sugar, therefore, is a bad thing to remove the bitterness of sulphate of quinia: the end may be better obtained by the use of some aromatic powder.—*Mag. fur Pharmacie.*

Phosphate of Quinia.—The phosphate of quinia, rendered slightly acid, is, according to M. Harless, a much milder medicine than the sulphate or the free alkali.

It is better retained on the stomach where irritation exists, or by nervous patients, or by those who are subject either to congestions of blood or inflammation ; its use does not occasion that unpleasant feeling which is sometimes produced after taking the sulphate : it does not so readily accelerate the motions of the heart, nor does it irritate the bronchiæ or lungs. In consequence of its insolubility and pulverulent state, it is administered in pills, from one to four grains being a dose.—*Bull. Univ. C. xx. 240.*

On the Development and Growth of Cantharides.—Zier. The flies always deposited their eggs on the smooth sides of the vessel in which they were inclosed ; it was found requisite that these sides should not be transparent ; so that when the glass capsules were used they were covered with black paper, and there the eggs were deposited. Each female produced from one to two hundred in a small heap. Nothing is more difficult than to observe the transformation of these eggs into larvæ, in consequence of the momentary nature of the change. M. Zier, knowing about what time to expect the change with certain eggs, waited for and watched them under the microscope, and was fortunate in catching the moment. He first remarked certain slight motions, followed by others much stronger and quicker, at one end of the egg, and instantly it was converted into a living being, a small larva. It was impossible to discover any envelope which might be supposed to be left by the insect ; the whole egg appeared to be vivified.

The larva is at first colourless, and formed of thirteen rings, of which the first is the head, the three next have each a pair of feet, by which the insect moves with considerable rapidity, the nine other rings form the body. Two black points on the first rings are the eyes, above is a sort of black antennæ, the last ring has two hairs. Almost immediately after the change, the posterior part of the larva acquires a dark tint, which advances gradually to the fifth ring, the fourth and third remain pale, but the second and first become black.

These small animals move very quickly, and soon leave the place where they were deposited as eggs. When they feel any movement in the neighbourhood, they roll themselves up so as to look like black points. The metamorphosis of all the eggs into larvæ, and the disappearance of the insects, does not require more than a quarter of an hour. The young larvæ reach the earth and then penetrate downwards.—*Bull. Univ. B. xx. 181.*

Effect of Light on Plants.—M. Leuchs. It is well known that solar light, by enabling plants to decompose and assimilate carbonic acid, gives them the power of forming volatile and aromatic principles, and of acquiring a green colour. Its presence is so necessary to flowering and fructification, that ripe seeds have never been obtained in darkness ; on the contrary, if an etiolated plant be exposed for three, four, or five hours to the sun, it immediately becomes of an equally intense green colour with those which have continually grown in light. Plants raised in the open air, when put into darkness, become pale and fade in two or three days ; those which, after being raised in darkness, have been exposed for a time to sunlight, cannot again support the privation of light, but die ; and water charged with

champhor, or essential oil, which has great power of invigorating plants, cannot prevent their destruction. The perfect absence of light is therefore very injurious to plants, and M. Leuchs concludes, that, without the light of the moon and stars, nights would destroy vegetables.

The light of a lamp can, although imperfectly, replace that of the sun; the plant becomes green and tends to the light. When seeds were germinated in three vessels, the first uncovered, the second covered with single, and the third with double paper, those of the first vessel exhibited less external development, but when dried, they gave more solid matter; those in the second were more developed, but were more aqueous and loose; the difference was still greater in the third vessel.

The texture of various plants appears to be more or less aqueous (if the word may be used), when deprived of light, according to the nature of the plants. When plants were placed in a damp cellar or cave, enlightened by a flame, those nearest the flame contained most solid matter; the results were so regular, as to present something like a law, relative to the action of various quantities of light on vegetables.

Light reflected by mirrors appeared to have a very beneficial influence upon plants, and M. Leuchs thinks that many hill sides are rendered fertile by the similar reverberation of light from the neighbouring rocks.—*Archiv von Castner*, xv.

